DOCUMENT RESUME

ED 204 053 RC 012 765

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TITLE Land Use Development in Gretna, Nebraska: A Cost Analysis.
INSTITUTION Nebraska Univ., Lincoln. Coll. of Agriculture.: Nebraska Univ., Omaha. Center for Applied Urban Research.
SPONS AGENCY Nebraska Rural Development Council, Lincoln.
PUB DATE 1 Jul 76
NOTE 90p.

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Community Planning; Community Services; Comparative Analysis; Construction Costs; *Costs; Land Settlement; *Land Use; Population Trends; *Residential Patterns; *Rural Areas; *Rural Development; Urban Areas; Urban to Rural Migration
IDENTIFIERS *Nebraska (Gretna); Private Sector; Public Sector

ABSTRACT

To test the hypothesis that costs are higher with a scattered development pattern than with a compact development pattern adjacent to the community's urban fringe, this study analyzed the private and public costs associated with each of these development patterns in the Gretna, Nebraska, area during the last 15 years. Cost data for each of the development patterns were obtained or estimated and analyzed against the hypothesis, and social and environmental effects associated with different land use patterns were analyzed to the extent that they could be identified and measured. Data indicated that private costs per housing unit, school and fire protection costs per housing unit, and spill-over effects in terms of social and environmental costs were higher for the scattered development pattern. The average private development cost of a housing unit in the scattered development pattern was almost 70% higher than in the compact development pattern. A number of hidden indirect costs associated with the scattered development type were borne by the community and area as a whole. Residents of scattered developments did not have to pay taxes on services and facilities provided by the municipal government, and they received benefits from services paid for primarily by city residents. (CM)

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LAND USE DEVELOPMENT IN GRETNA, NEBRASKA
A COST ANALYSIS

Prepared for the
Title V Rural Development Council for Nebraska

The preparation and publication of this report was financed, in part, by a grant from Title V of the Rural Development Act of 1972 to the College of Agriculture, University of Nebraska-Lincoln.

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July 1, 1976

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ACKNOWLEDGMENTS

This study was carried out by staff of the Center for Applied Urban Research with Dr. Paul S.T. Lee as the principal investigator. The completion of the study would not have been possible without the assistance and cooperation from the City of Gretna, Sarpy County and the Gretna School District. Special acknowledgment is given to Professor Paul Gessaman, Department of Agricultural Economics, University of Nebraska-Lincoln, and Professor Harold F. Gordon, Department of Public Administration, University of Nebraska at Omaha, for their valuable commencs and suggestions during the course of the study.

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CHAPTER I

INTRODUCTION

Recent Migration Trends and Their Impact on Rural Land Development

The rural-to-urban migration of the U.S. population in the decades after World War II has been reversed. According to a recent U.S. Department of Agriculture publication, non-metropolitan areas gained 4.2 percent in population while metropolitan areas gained only 2.9 percent from 1970 to 1973.[1] This recently-detected reverse migration trend from urban to rural areas is creating development pressures on many small rural communities. These pressures are particularly acute in the Platte and Elkhorn Valley corridors of Nebraska where rural population growth is most evident. They raise questions about methods for accommodating this growth. Should the closely-knit compact pattern of urban development typical of Nebraska's small rural communities be maintained or should residential development be permitted to scatter at random through rural areas? What are the economic, social and environmental benefits and costs of each of these development patterns? Definitive answers to these questions are needed to guide local officials charged with the responsibility of making land use decisions for their communities.

Located on the southwest fringe of the Omaha metropolitan area, Gretna has been one of the most rapidly growing communities in rural Nebraska during the past 15 years. From 1960 to 1970, Gretna's population increased 109 percent, and approximately one-third of Gretna's housing stock has been built since 1970. An examination of aerial photographs shows that both types of development--compact growth in the urban fringe and scattered, fragmented growth in the surrounding

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[1] See Calvin L. Beale, "The Revival of Population Growth in Non-metropolitan America," ERS - 605, Economic Research Service, U.S. Department of Agriculture (Washington, D.C.: U.S. Government Printing Office, June, 1975).

agricultural area--have taken place in the Gretna community during the past 15 years. Thus, Gretna is an appropriate area in which to study and compare the impacts of both compact and scattered development patterns.

Purpose of the Study

The major purpose of the study was to assess the economic impact associated with different patterns of land use development in rural Nebraska. The hypothesis underlying this inquiry was that costs are higher with a scattered and fragmented development pattern than with a compact development pattern adjacent to the community's urban fringe. Historical cost data with respect to each of these development patterns have been obtained or estimated and analyzed against this hypothesis. Social and environmental effects associated with different land use patterns have been analyzed to the extent they can be identified and measured.

Although this study was confined to the Gretna area, principles derived from the study should be applicable to rural communities throughout Nebraska, and particularly in the Platte and Elkhorn Valley corridors where many small communities have development potentials similar to Gretna's. It is hoped these findings will assist the leaders and local officials of those communities to determine how land should be used to serve the best interests of the community.

Operational Procedure and Methodology

This study consists of three phases: identification of land use patterns, cost classification and estimation, and statistical analysis and conclusions.

1. Identification of land development patterns. Land use patterns were identified mainly by examining aerial photos taken at various time intervals. Field trips were made to evaluate locations that could not be identified clearly from the aerial photos.

2. Cost classification and estimation.

   a. Collection and classification of costs. Direct costs (capital and operating costs) and indirect costs (environmental costs) associated with land development were collected and classified. Cost estimation procedures were used in instances in which costs were not available. For costs that were not quantifiable, qualitative statements about the effects were made.

b. Unit cost estimation. Direct costs per housing unit were derived for each cost category in order to allow relevant comparisons between different patterns of land use. Indirect costs per housing unit were derived in the same manner to the extent they could be quantified. For costs for which quantitative estimates were not available, qualitative statements were made.

c. Constant dollar conversion. All costs are expressed in 1975 constant dollars (1975=100). Where costs were not available in 1975 dollars, the following cost indices were used as cost inflators:

1. Consumer Price Index of service group for most public costs except transportation.
2. Consumer Price Index of transportation group for public transportation costs.
3. Nebraska Farm Real Estate Value Index, Nebraska Agricultural Statistics--1975 for value of building lots.
4. Price Index of New One-family Houses Sold in North-Central Region of the U.S.A., Construction Report, U.S. Department of Commerce, Bureau of Census, for construction costs.

3. Statistical analysis and conclusions.

a. Construction of cost tables and maps of land use patterns. Tables of unit costs for each land use pattern were constructed and documented. For comparative analysis, maps of different land use patterns were also prepared.

b. Statistical analysis and test of hypothesis. Statistical analysis was performed for the test of significance in cost variation between the two land use patterns. Non-quantifiable indirect costs were estimated for each land use pattern.

c. Conclusions. Conclusions were based upon findings from the comparative analysis of cost.

4. Assumptions. In estimating costs associated with different land use patterns, the following general assumptions and considerations were made:

a. In estimating costs it was assumed there were no economies of scale among developments of various sizes. The estimated unit costs represent average costs for a particular land use pattern regardless of the size of the new developments.

b. It was assumed that housing standards, number of rooms and special facilities had no significant influence on costs.

c. It was assumed that no significant costs were incurred because of the existence of external economies or diseconomies. Hence, these were not identified and were not taken into consideration in the cost analysis. For instance, residents of the rural portion of Gretna community may be using City (Gretna and/or Omaha) facilities such as parks, streets and libraries for which they are not taxed. Proximity to a metropolitan area, however, does have impact on land use in smaller communities. This topic, as part of regional development and land use planning implications, is discussed in Appendix A.

CHAPTER II

POPULATION GROWTH AND URBANIZATION

The Gretna Community

Gretna is located at the intersection of U.S. Highway 6 and State Highway 370 in northwestern Sarpy County, Nebraska. It lies approximately 18 miles southwest of downtown Omaha and two miles north of Interstate 80 and State Highway 31 (see Map 1). Platted by the Lincoln Company in October, 1887, the Village was incorporated in July, 1889, and designated a City of the Second Class in 1969.

In the present investigation, the Gretna community was categorized into three approximately concentric areas: the City of Gretna, the Gretna fringe and rural Gretna (see Map 2). The City of Gretna serves as the commercial, cultural and recreational center for residents of the entire community. The Gretna fringe is the one-mile extension of the City's zoning jurisdiction beyond the City limits. Rural Gretna is defined as the portion of the community within the Gretna School District and/or Gretna Fire District but outside the Gretna fringe.

Population Change

The Gretna community was predominantly a rural farm community in the early 1900's. Statistics show that Gretna's population declined nine percent between 1940 and 1950, from 482 to 438. The trend of the 1940's was reversed in the 1950's. Gretna and its fringe area experienced a 70 percent increase in population during the period 1950 to 1960. During the past 15 years, 1960-1975, the population of Gretna nearly tripled from 745 in 1960 to 2,156 in 1975, while the population in the Gretna fringe increased 52 percent (see Table 1). This growth was reflected in the number of students attending schools. For the same time period of 1960-1975, student enrollment in the Gretna School District increased 160 percent, from 424 in 1960 to 1,105 in 1975.

The rapid population growth spurred residential development. Between

MAP 2
GRETNA COMMUNITY

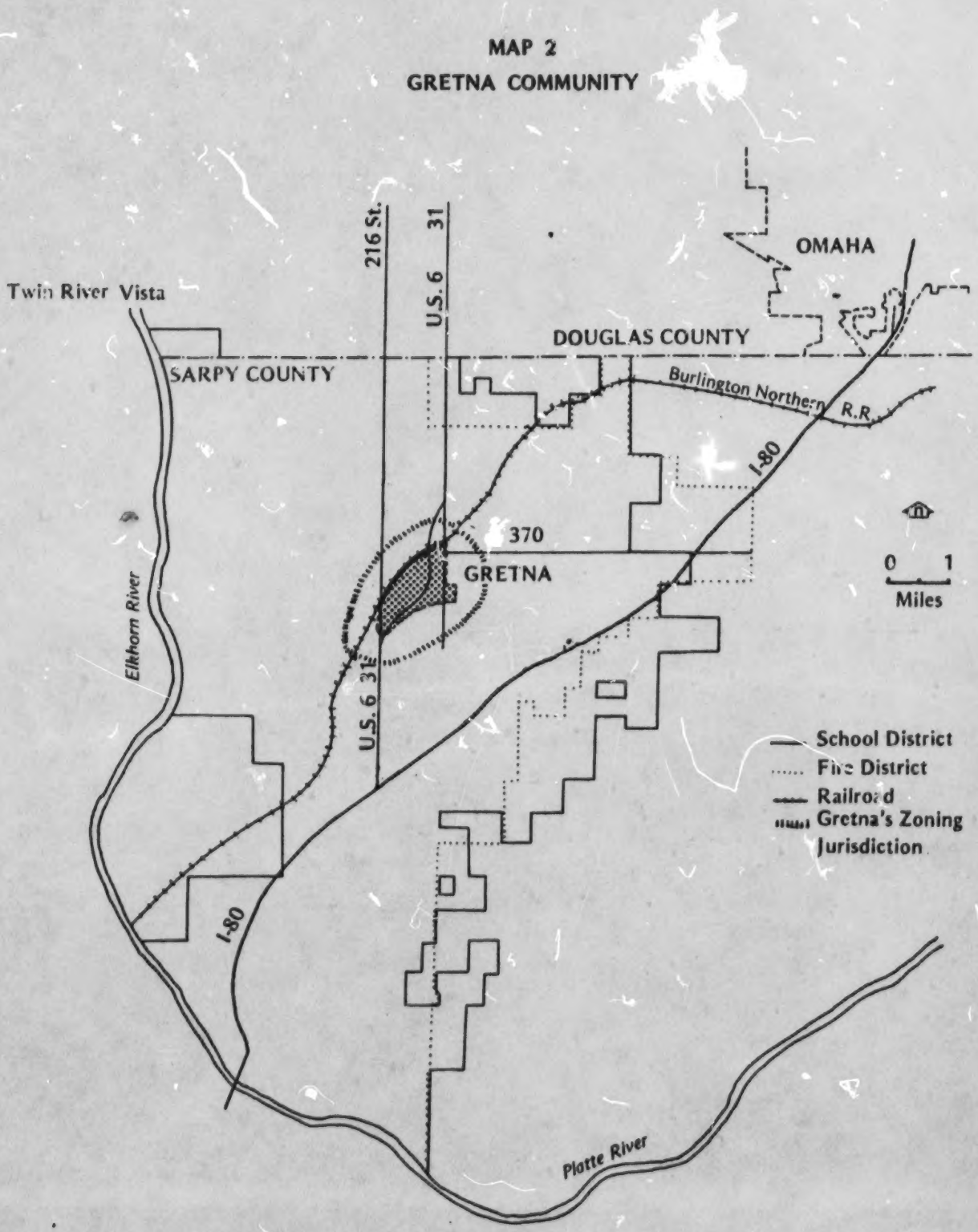

TABLE 1

POPULATION, HOUSING UNITS, AND SCHOOL ENROLLMENT
IN GRETNA AND SARPY COUNTY, NEBRASKA, 1960-1975

	1960	1970	1975	Growth, 1960-1975 Number	Percent
City of Gretna and Its Fringe[a]					
Population	745	1,557	2,156	1,411	189.4
Occupied Housing Units	201	448	655	454	225.9
Rural Gretna[b]					
Population	790	1,016	1,201	411	52.0
Occupied Housing Units	197	260	313	116	58.8
Gretna School District					
Student Enrollment	424	900	1,105	681	160.6
Sarpy County					
Population	31,281	63,696	84,183	52,902	169.1
Occupied Housing Units	7,780	15,980	24,102	16,322	209.8

[a] Gretna Fringe is defined as the area outside the Gretna City limits but within its one-mile extra-territorial jurisdiction.

[b] Rural Gretna is defined as the area outside Gretna's one-mile extra-territorial jurisdiction but within the Gretna School District (School District 37).

Sources: U.S. Census of Housing--1960, HC (1)-B29, Nebraska, 1961; U.S. Census of Housing--1970, HC (1)-B29, Nebraska, 1971; "1975 Population and Household Estimates," Metropolitan Area Planning Agency; Gretna City Clerk's Office; Sarpy County Building Permits and Inspection Department; Sarpy County School Superintendent's Office.

1960 and 1975, 454 new housing units were built in the City of Gretna and its one-mile extra-territorial jurisdiction. This represents a 226 percent increase from 201 housing units in 1960. For rural Gretna an estimated 116 housing units were built between 1960 and 1975, an increase of 59 percent.

Agricultural Base

The Gretna School District encompasses approximately 84 square miles or 53,760 acres, which is about one-third of Sarpy County. In contrast to the eastern two-thirds of Sarpy County, however, which has undergone rapid urbanization and major change in its agricultural base during the past 15 years, the western third of Sarpy County comprising the Gretna community has experienced less dramatic change in its agricultural character. Agricultural statistics for Sarpy County are given in Table 2. Comparable statistics are not available for the Gretna community, but a comparison between the land use statistics in Table 2 and those in Table 5, Chapter III, illustrates this contrast. While total farm land in Sarpy County decreased by over 9,000 acres as shown in Table 2, only 860 acres of this decline occurred in the Gretna community as shown in Table 5. While farm land in Sarpy County overall was decreasing by seven percent, farm land in the Gretna community decreased between 1.5 and 2.0 percent. Thus, although the Gretna community experienced a substantial percentage increase in population during the last 15 years, it largely escaped the inundation of urban growth experienced by the eastern two-thirds of the County. As urbanization spreads outward from Omaha, the Gretna community may not be so fortunate during the next 15 years.

One other point about the Gretna community's agricultural base needs to be mentioned. Its best agricultural soils, approximately 22,400 acres, lie to the north, east and south of the City of Gretna. This is the same area in which most of the scattered development has occurred. Little development has occurred on the more rolling land with poorer agricultural soils to the west of the City (see Map 3, Chapter III). If, during the next 15 years, the outward wave of urbanization follows this same pattern when it reaches the Gretna community, it will have a very serious adverse impact on the community's agricultural base.

TABLE 2

CHANGES IN AGRICULTURAL ACTIVITIES
SARPY COUNTY, NEBRASKA
1959-1974

	1959	1964	1969	1974	Change=1959-1974 Units	Change=1959-1974 Percent
Number of Farms	672	587	525	495	-177	-26.3
Average Size of Farms (Acres)	198.1	222.3	231.0	240.6	+42.5	+21.4
Employment in Agriculture, Forestry, and Fisheries	736	NA	527	NA	--	--
Total Land Area (Acres)	151,040	151,040	151,040	151,040	--	--
Farm Land (Acres)	128,361	130,477	121,297	119,116	-9,245	-7.2
Percent of Total	85.0	86.4	80.3	78.9	--	--
Crop Land (Acres)	112,128	111,342	100,460	94,050	-18,078	-16.1
Percent of Farm Land	87.4	85.3	82.8	79.0	--	--
Wood Land (Acres)	6,731	6,907	7,590	8,020	+1,289	+19.2
Percent of Farm Land	5.2	5.3	6.3	6.7	--	--
Other--House Lots, Roads, etc. (Acres)	9,501	12,232	13,241	17,046	+7,545	+79.4
Percent of Farm Land	7.4	9.4	10.9	14.3	--	--
Non-Farm Land	22,679	20,563	29,743	31,924	9,245	+40.8
Percent of Total	15.0	13.6	19.7	21.1	--	--
Value of Land and Buildings						
Average Per Farm	$62,642	$95,281	$129,450	NA	--	--
Average Per Acre	$297.68	$426.77	$560.28	NA	--	--

Source: U.S. Census of Agriculture, 1964, 1969; Nebraska Agricultural Statistics, 1974; U.S. Bureau of Census, Census of Population, 1970.

Property Valuation, Bonded Debt and Mill Levy

Table 3 shows the changes of assessed property valuation, bonded debt and mill levies for the City of Gretna, Gretna School District and Sarpy County. It can be seen that total assessed valuation in all three jurisdictions nearly tripled with growth rates ranging from 192.5 percent in Gretna City to 233.3 percent in Sarpy County over a period of 13 years from 1962 to 1975. The annual growth rates were 14.8 percent, 17.3 percent and 17.9 percent for the City of Gretna, Gretna School District and Sarpy County respectively. Property taxes levied rose steadily for both the Gretna School District and Sarpy County, up 119.3 percent and 92.7 percent respectively from 1962-1975. The mill levy for the City of Gretna declined significantly between 1962 and 1968. Since 1968 it has risen steadily but by 1975 was still 2.9 mills below its high in 1962.

Table 4 shows a comparison between property taxes levied on residents of the City of Gretna and of the Gretna fringe in 1975. Residents of the City of Gretna paid the highest tax rate, 113.99 mills, while those living in the rural portion of Gretna School District, outside Sanitary and Improvement Districts, paid the lowest tax rate, 88.34 mills.[2] In other words, a resident with a $30,000 home in the City of Gretna paid $1,196.90 in property taxes in 1975 while a rural resident with a similarly valued property not in a Sanitary and Improvement District paid $927.57 in property taxes. Education accounted for 60.4 percent of the property tax in the City of Gretna and 77.9 percent in the rural portion of Gretna School District.

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[2]Those who live in a Sanitary and Improvement District pay an additional 12 to 20 mills to their SID for street maintenance, water and sewer systems. Approximately one-half the new houses in rural Gretna are in Sanitary and Improvement Districts.

TABLE 3

ASSESSED VALUATION, BONDED DEBT AND TOTAL MILL LEVY OF GRETNA, GRETNA SCHOOL DISTRICT AND SARPY COUNTY, NEBRASKA, 1962-1975

	1962	1968	1972	1975	Change - 1962-1975 Amount	Change - 1962-1975 Percent
City of Gretna						
Assessed Valuation	$1,292,898	$2,318,548	$3,022,089	$3,782,299	$2,489,401	192.5
Bonded Debt	62,000	289,000	257,000	NA	--	--
Total Mill Levy	29.80	21.50	22.90	26.90	-2.9	-9.7
Gretna School District[a/]						
Assessed Valuation	$4,058,142	$9,159,746	$10,597,215	$13,184,017	$9,125,875	224.9
Bonded Debt	427,000	494,000	NA	NA	--	--
Total Mill Levy	31.40	53.26	65.43	68.86	+37.46	119.3
Sarpy County						
Assessed Valuation	$54,192,560	$96,646,857	$129,829,375	$180,627,167	$126,434,607	233.3
Bonded Debt	--	--	--	--	--	--
Total Mill Levy	7.41	12.95	12.26	14.28	+6.87	92.7

[a/] Includes City of Gretna. Assessed valuation of the rural portion of the District increased from $2,765,244 in 1962 to $9,401,718 in 1975, a 239 percent increase.

Source: Sarpy County Assessor's Office, Papillion, Nebraska.

TABLE 4

TAX RATES FOR GRETNA COMMUNITY RESIDENTS
1975

	Mills							
	City of Gretna	Gretna Fringe and Rural Gretna						Rural Douglas County
		SID 24	SID 29	SID 34	SID 55	SID 69	Non-SID	
City of Gretna	26.90	--	--	--	--	--	--	--
Gretna School District	68.86	68.86	68.86	68.86	68.86	68.86	68.86	68.86
Sarpy County	14.28	14.28	14.28	14.28	14.28	14.28	14.28	14.28
Special Education	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Papio Creek Maintenance	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Metropolitan Technical Community College	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Omaha-Douglas Civic Center	--	--	--	--	--	--	--	0.50
Fire District	--	1.25	1.25	1.25	1.25	1.25	1.25	0.99
Sanitary and Improvement District	--	12.00	20.00	15.00	20.00	20.00	--	--
Total Mill Levy	113.99	100.34	108.34	103.34	108.34	108.34	88.34	88.58

Sources: County Assessor's Office, Sarpy and Douglas Counties, Nebraska.

CHAPTER III

LAND DEVELOPMENT PATTERNS IN GRETNA, 1960-1975

Changes in Land Use Since 1960

For the past 15 years, land use in the Gretna community has responded to increased population pressure. The greatest increase occurred in land used for residential construction and parks and recreation, as shown in Table 5. Land used for residential development in Gretna and the Gretna fringe expanded from 42 acres in 1960 to 190 acres in 1975, an increase of 351 percent in 15 years. During this period, land used for community facilities such as municipal offices, a library, schools and churches increased by 147 percent from 19 to 47 acres, and land used for park and recreation purposes increased 300 percent from five to 20 acres.

Rural Gretna, the area outside the City of Gretna and its one-mile extra-territorial jurisdiction, has also changed in the past 15 years. The primary change has been in the amount of farm land used for single-family residential development. It is estimated that residential land use doubled from 591 acres in 1960 to 1,208 acres in 1975 (see Table 5). Approximately 84 percent of the increase in land for residential use was converted from farm land, the rest from timberland.

Identification of Land Use Development Patterns

Two major residential development patterns have been identified in the City of Gretna and the Gretna community: the compact development within or adjacent to the Gretna City limits and the scattered or leap-frog development pattern in rural Gretna outside the City's extra-territorial jurisdiction.

Compact Development Pattern. Since 1960, approximately 454 new housing units have been constructed in and adjacent to the City of Gretna. Of these, 309 units (68 percent) were constructed within the City limits and the remaining 145 units (32 percent) within Gretna's extra-territorial

TABLE 5

LAND USE IN GRETNA COMMUNITY, 1960-1975

Land Use Category	Land Use (Acres) 1960	1975	Change Acres	Percent
City of Gretna and Gretna Fringe				
Residential	42	190	148	351
Single-Family	42	174	132	314
Multi-Family	--	16	--	--
Trade and Service	8	24	16	200
Industrial	36	41	5	14
Community Facilities	19	47	28	147
Parks and Recreation	5	20	15	300
Highway and Street Right of Way	321	352	31	10
Subtotal	431	674	243	56
Rural Gretna[a/]				
Residential Single-Family	591	1,208	617	104

[a/] Rural Gretna is the area within Gretna School District but outside the City limits and one-mile jurisdiction of Gretna.

Source: Estimated through The Comprehensive Plan, Gretna, Nebraska (1972) and aerial photos -- Agricultural Soil Conservation Service.

jurisdiction (see Map 3). Almost all (422 units or 93 percent) were conventionally built single-family housing units; 32 units were in four apartment buildings. Five subdivisions were identified as compact developments. Their features varied with different developers and different time periods (see Table 6).

(1) Wesgaye Addition: A 15-acre tract on the southwest edge of Gretna, this subdivision was established in the late 1950's. About 13 out of its 30 housing units were built prior to 1960, the rest in the early 1960's. All were conventionally laid-out single-family units. The Sanitary and Improvement District (SID) mechanism was not used.

(2) West Plain Addition: This subdivision was started in 1959 on approximately 100 acres north of Gretna's City limits at that time. Approximately, two-thirds of its 230 single-family housing units were built in the early 1960's. About 70 units have been built on a custom basis since 1966. No SID was established. West Plain was annexed by the City of Gretna in 1969.

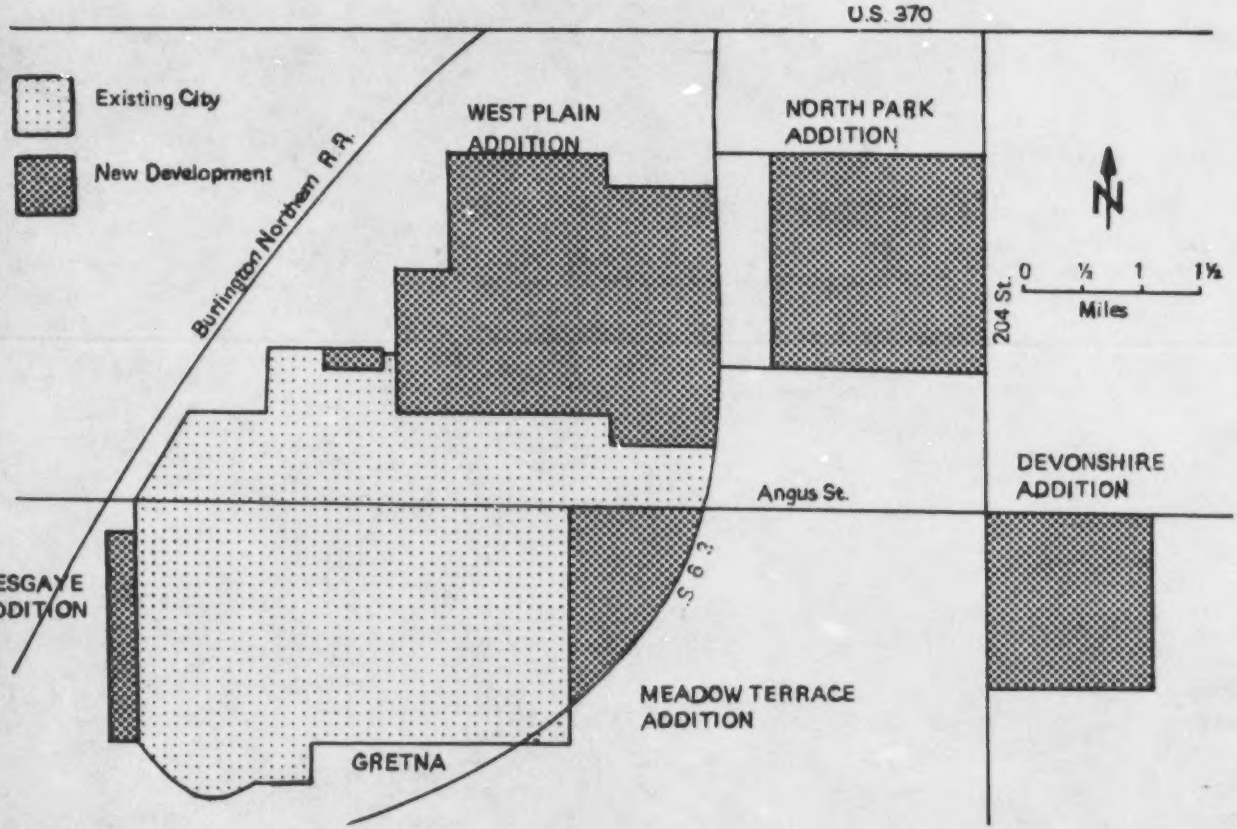
(3) Meadow Terrace Addition: Located on 20 acres southeast of Gretna, this addition was developed in the early 1960's. Approximately half of its conventionally laid-out 37 housing units were built prior to 1964, the rest between 1964 and 1971. The SID mechanism was not used.

(4) North Park Addition: Located northeast of Gretna and bounded by Highway 6 on the west and Highway 370 on the north, the development of this 58-acre subdivision began in 1972 and all of its 129 single-family units were completed by the end of 1974. Developed as an SID, this addition was located outside the Gretna City limits but within its extra-territorial jurisdiction. The City of Gretna provides public services such as police, fire, sewer and water, with an extra charge of up to 150 percent of the City rate on all utilities.

(5) Devonshire Addition: Similar to North Park Addition, this subdivision was also located outside the Gretna City limits but within its extra-territorial jurisdiction. It is situated on 30 acres south of the North Park Addition and east of Highway 6. The development of this addition began in 1973 as SID 69. In contrast to the other subdivisions of the compact pattern, most of its 16 units were laid out in clusters of single-family units on one- to two-acre lots.

MAP 3

COMPACT DEVELOPMENT PATTERN



Source: Remote Sensing Imagery from Nebraska Stabilization and Conservation Service, Lincoln, Nebraska.

TABLE 6

COMPACT DEVELOPMENT PATTERN,
GRETNA, NEBRASKA, 1960-1975

Name of Subdivision	Total Acreage[a]	Number of Plotted Lots	Average[b] Lot Size (Acre)	Completed Housing Units	Sanitary Improvement District	Year Development Established
West Plain	100	230	0.25	230	No	1959
Meadow Terrace	20	37	0.28	37	No	1962
Wesgaye	15	30	0.25	30	No	1958
North Park	58	129	0.20	129	SID 55	1971
Devonshire	30	16	1.50	16	SID 69	1972
Others in Gretna[c]	2	12	--	12	--	1960-75
Total	225	454	0.27	454	--	--

[a] Total acreage includes residential, commercial and street right of way uses.

[b] Average lot size was calculated by dividing the amount of land development by total number of residential lots after making allowance for land used for other than residential purposes (e.g., streets and commercial land use).

[c] Eight of the 12 units are multi-family units, thus the average size of lots is not comparable to single-family units.

Sources: Gretna City Clerk, Gretna, Nebraska; Building Permit and Inspection Department, Sarpy County Court House, Papillion, Nebraska; and interviews with private developers.

Scattered Development Pattern. In the past 15 years, an estimated 116 non-farm housing units were built in the Gretna fringe and identified as scattered development (see Map 4). Of these, 53 (46 percent) were individually built, the rest (63 or 54 percent) were built in six subdivisions (see Table 7). Major characteristics of these six subdivisions are:

(1) Westridge Farm Addition: Located about one and one-half miles southeast of the City of Gretna, it was developed in early 1974 on 80 acres of farm land. It has 35 platted single-family lots, but only 24 units were completed by 1975. SID 29 was established to maintain water (two wells) and the sewer (12 septic tanks) system and roads. Currently, it has a 20-mill levy and $38,000 in bonded indebtedness.

(2) Sarpy Heights Addition: Located about one and one-half miles northeast of the City of Gretna east of Highway 6, the Sarpy Heights Addition was established in 1966. It includes 50 acres with 40 platted lots averaging one acre in size. Seven units were constructed between 1967 and 1974. The SID has its own water and sewer system and has the responsibility of maintaining its paved roads; mill levy is 15 mills.

(3) Melia Hill Addition: Located on 40 acres approximately three miles southwest of Gretna, the development of this subdivision started in the early 1960's with 16 platted lots averaging about two acres per lot. Up to 1975, only half the lots were filled with single-family houses. Since no SID mechanism was instituted, homeowners build their own wells and septic tanks for water supply and sewage disposal.

(4) Country Estate Addition: Situated on 34 acres approximately two and one-half miles southeast of Gretna north of I-80, this subdivision was established in 1966. Fifteen platted single-family lots range from one and one-half to six acres in size (2.5 acres in average). Eight houses have been built in the past ten years. Since no SID was instituted, residents are responsible for their own wells and septic tanks for water and sewer treatment.

(5) Thousand Oaks Addition: This 20-acre subdivision of timberland is located about six miles south of Gretna east of Highway 6. It has a total of about 35 single-family lots averaging one-half acre in size. The development of this subdivision started about a decade ago as SID 24, which owns the water and sewer systems and maintains the roads. Up to 1975,

MAP 4
SCATTERED DEVELOPMENT PATTERN

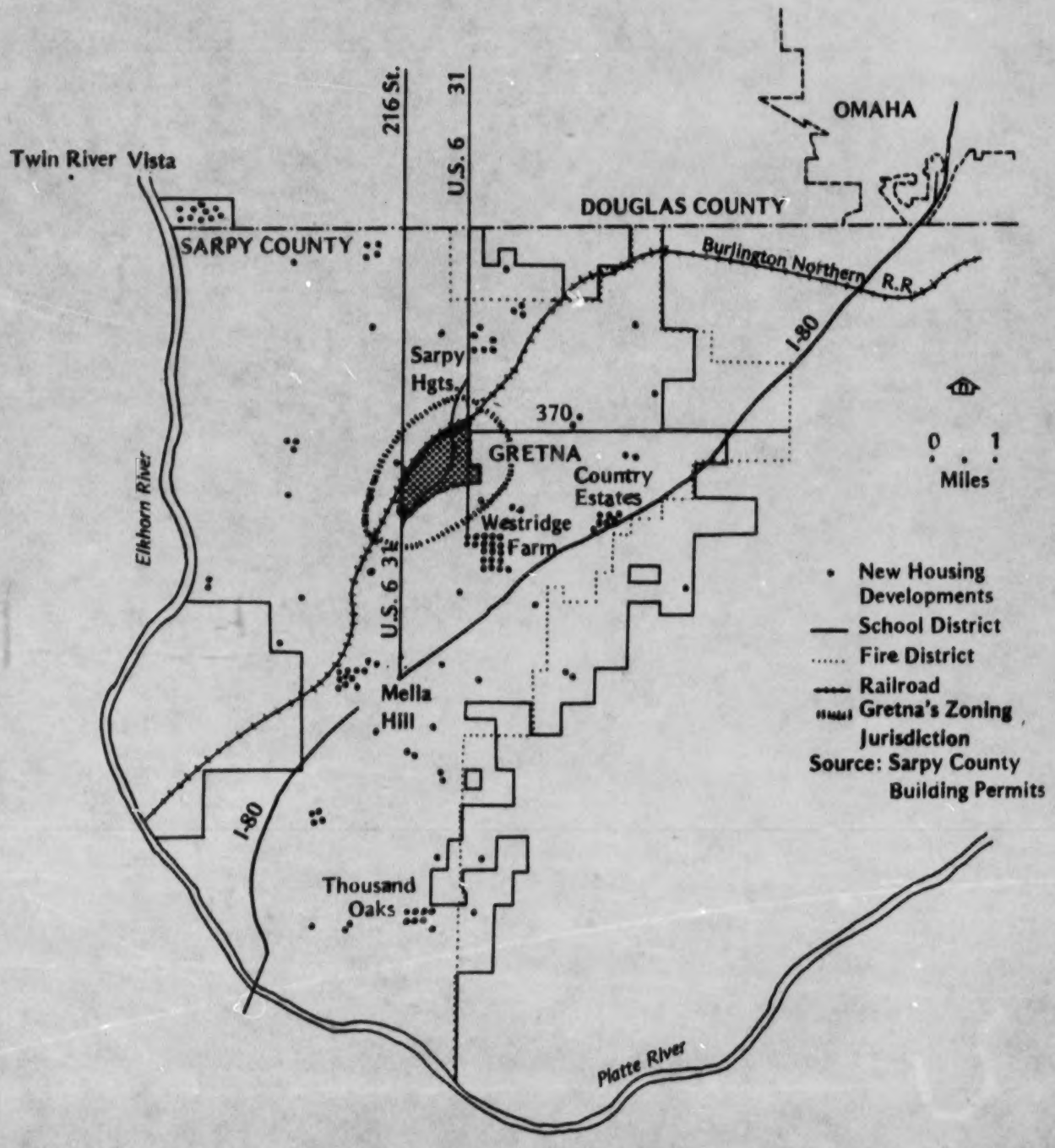


TABLE 7

SCATTERED DEVELOPMENT PATTERN,
GRETNA, NEBRASKA, 1960-1975

Name of Subdivision	Total Acreage (Acres)	Number of Plotted Lots	Average Lot Size (Acres)	Completed Housing Units	Sanitary Improvement District	Year Development Established
Westridge Farm	80	35	1.94	24	SID 29	1964
Sarpy Heights	50	40	1.06	6	SID 34	1966
Melia Hill	40	16	2.13	8	None	1962
Thousand Oaks	20	35	0.49	7	SID 24	1966
Country Estates	34	15	1.93	8	None	1966
Twin-River Vista	80	26	2.62	10	None	1963
Others[a] (Individual)	313	—	5.90	53	--	1960-75
Total	617	220	2.60	116	--	--

[a] The average size of resident lots for individual development was estimated from a 15 percent sample interview and total acreage was estimated by multiplying the average lot size by the total number of housing units.

Sources: Gretna City Clerk, Sarpy County Building Permits and Inspection Department, and interviews with private developers.

only seven single-family houses have been built. The property tax levy is 12 mills.

(6) Twin-River Vista (first and second) Addition: Situated on 80 acres of timberland beside the Elkhorn River about five miles northwest of Gretna in Douglas County, this subdivision was established in 1963, but only 10 of its 26 single-family lots were improved with houses by 1975. The average lot size is two acres. There is no SID, although this addition has building covenants enforced by a five-member committee. Homeowners build their own wells and septic tanks. Douglas County maintains the roads, the county sheriff polices the area and the Elkhorn Fire District provides fire protection.

Contrast and Comparison

Four major features, besides physical location, distinguish the compact development pattern from the scattered development pattern as described in the previous section and have a significant impact on cost analysis. These are described in this section and are summarized in Table 8.

TABLE 8

COMPARISON OF HOUSING CHARACTERISTICS
COMPACT AND SCATTERED DEVELOPMENT PATTERNS

Major Characteristics	Compact Development Pattern	Scattered Development Pattern
Type of Housing	Single-family conventionally built	Single-family clustered or individually located
Average Size of lot (Acre)	0.27	2.60
Water and Sewer System	Public owned water and sewer systems	31% have community (SID) owned wells and sewer treatment systems, 69% have private wells and septic tanks
School Bus Service	No need for school bus service	School bus service is available

Site Design. Site design reflects the lifestyle of the residents, affecting costs of construction, road maintenance and snow removal. While almost all developments in the scattered development pattern were single-family units, their site design differed significantly. For the compact development pattern, most houses were built in conventional subdivisions. On the other hand, most of the houses in the scattered development pattern were either individually located or built in clusters.

Average Lot Size. Resulting from differences in site design, the average size of building lots differed substantially between the two development patterns. It is estimated that the size of an average lot in a scattered development is almost ten times that of the average lot in a compact development. Thus, the cost of the lot and landscaping for houses in the scattered development pattern would be higher than for those in the compact development pattern.

Water and Sewer Systems. Homeowners in the compact development pattern have access to the City-owned water system and sewage treatment plants, while about two-thirds of the homeowners in the scattered development pattern installed their own wells and septic tanks. This reflects differences not only in building costs, but also constitutes a major concern with regard to environmental impact. Leaks in these individual septic tank and field drain systems can create health hazards.

School Bus Service. While there is no need for school bus service for children living in the compact development pattern, school bus service must be provided for those who live scattered in an area of approximately 84 square miles. Extra bus service increases school costs which raise property taxes.

CHAPTER IV

COST ANALYSIS BY LAND DEVELOPMENT PATTERNS

This Chapter deals exclusively with analysis of costs incurred by the private and public sectors associated with each development pattern. Various categories of costs were obtained from interviews with developers, homeowners, utility companies, fire districts, school, City and County officials. For the purpose of making relevant comparisons, both group and unit costs were converted into 1975 dollars. Only those costs incurred in the last ten years (1965-75) were compiled and analyzed because key public records beyond 1965 are no longer available.

Cost Classification

Costs incurred from land development are grouped into three broad categories: private, public and social and environmental costs. Private costs are those of the private developer and homeowner such as land acquisition, land platting, landscaping, building construction, road and street construction and utility installation. Public costs are those the public sector must bear because of the new land development, including municipal administration, school expenses, parks and recreation, fire protection and police protection. Costs associated with water and air pollution, wildlife destruction, reduction of agricultural land, crime and health hazards are considered social and environmental costs. A detailed analysis of each of these categories follows.

Private costs.

a. Cost of building lots. Building lot costs include costs of acquiring raw land, of preparing the land (grading and landscaping, constructing streets and installing utility systems. Generally, farm land is purchased in tracts ranging from 40 to 100 acres. Farm land can also be purchased by individuals in smaller tracts but seldom in less than ten acres. In 1975, farm land in Sarpy County sold for an average of $2,000 per acre.

After acquisition, the land has to be mapped, platted and graded. Architectural, engineering and legal fees account for approximately 20 percent of the total cost of a newly-developed building lot. Costs associated with land acquisition, street construction, and installation of water and sewer systems account for the remainder of the total development costs. Thus, total costs for a developed building lot vary not only by size of lot but by subdivision and by type of utility system. Building lots within Sanitary and Improvement Districts usually have community-owned water and sewer systems. Houses built outside such districts usually install their own wells and septic tanks. The cost of building an individual well and septic tank averaged $3,500 in 1975. An estimated 80 septic tanks and 73 wells were built by individuals in rural Gretna in the past ten years.

Table 9 shows costs of developing building lots by land development pattern in actual as well as in constant dollars.[3] It can be seen that the 1975 total costs of building lots for the scattered development pattern were more than those of the compact development pattern even though the latter had more units. Unit costs of building lots associated with the scattered development pattern were almost three times as high as those with the compact development pattern.

b. Home construction costs. Costs of labor and materials needed to put a house in place on a fully developed lot vary by type and size of living space. Construction costs were estimated from the value of building permits, which are in proportion to the type of building and number of square feet in the proposed building.[4] Both the City of Gretna and Sarpy

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[3]Constant dollars were obtained by using 1975 Consumer Price Index as the base-year dollars (1975=100).

[4]During the period between 1959 and 1975, building permit offices of Gretna, Sarpy County and Douglas County generally had a uniform rate of assessment on permit valuation. For example, Sarpy County had a flat rate of $10 per square foot for all types of one-family structures; Gretna City had a set of rates pertaining to different types of houses; $10 per square foot for the frame or brick veneer with basement all levels of construction, $5 per square foot for the secondary story of full two story houses and $9 per square foot for the frame or brick veneer without basement; as a comparison, the rate used in Douglas County was $8.50 per square foot for a one-story building, $10 per square foot for a one and one-half story building and $11.50 per square foot for a two-story building. Since most one-family houses in Gretna City and rural Gretna were one and one-half story buildings, the evaluation rate for such a house was practically identical, i.e., $10 per square foot.

TABLE 9

BUILDING LOT COSTS BY DEVELOPMENT PATTERN, 1965-1975[a/]

Fiscal Year	Compact Development Pattern					Scattered Development Pattern				
	Number of Units	Actual Dollars[b/]		Constant Dollars[c/]		Number of Units	Actual Dollars[b/]		Constant Dollars[c/]	
		Total	Average	Total	Average		Total	Average	Total	Average
1965-66	4	$ 9,400	$2,350	$ 20,000	$5,000	8	$ 55,500	$6,937	$ 118,100	$14,762
1966-67	8	20,110	2,514	40,000	5,000	5	35,896	7,180	71,400	14,280
1967-68	13	35,520	2,732	65,000	5,000	7	50,628	7,233	92,650	13,236
1968-69	2	5,902	2,951	10,000	5,000	5	34,820	6,964	59,000	11,860
1969-70	14	43,223	3,087	70,000	5,000	10	78,050	7,805	126,400	12,640
1970-71	25	78,552	3,142	125,000	5,000	7	56,306	8,044	89,600	12,800
1971-72	75	213,541	2,847	334,000	4,453	17	125,567	7,386	196,400	11,553
1972-73	80	257,478	3,218	371,000	4,638	23	183,392	7,974	264,250	11,489
1973-74	26	85,572	3,291	108,000	4,154	18	184,811	10,267	233,250	12,958
1974-75	11	58,502	5,318	58,500	5,318	9	131,000	14,555	131,000	14,555
Total	258	$807,798	$3,131	$1,201,500	$4,657	109	$935,970	$8,587	$1,382,050	$12,679

[a/] Costs of building lot includes cost of land acquisition, land preparation and costs of installation of utility systems.

[b/] Actual dollar costs were estimated from 1975 dollar costs, using the Nebraska Farm Real Estate Value Index (Nebraska Agricultural Statistics, 1975) as a price deflator.

[c/] The constant dollars were obtained by using 1975 dollars as the base year index. The base year dollar costs were obtained from interviews with developers and homeowners.

Source: City Clerk's Office, Gretna; Building Permits Inspector, Sarpy County Court House, Papillion; Building Permits Inspector, Douglas County, Omaha; interviews with developers and homeowners.

County have building permit requirements.

The values of building permits for all homes built in the City of Gretna, Gretna fringe and rural Gretna in the past ten years were obtained from the Gretna City Clerk's Office and the Offices of Building Permits and Inspections in both Sarpy and Douglas Counties. The ratio between the value of a building permit and actual construction cost was established as 0.50 in consultation with building permit inspectors and private developers, and was verified from information on construction costs obtained by interviewing a sample of homeowners. Tables 10 and 11 show the value of building permits as well as the estimated total construction costs in current dollars and in 1975 dollars for new residential units in the compact development pattern and the scattered development pattern. Both the value of building permits and the construction costs in the scattered development pattern are much higher than those of the compact development pattern, indicating houses in rural Gretna are generally larger than those in the City of Gretna and the Gretna fringe.

Public costs.

New land development, particularly new residential development, adds burdens to the public sector with increasing demand for adequate public services such as educational services, street and road maintenance and police and fire protection. As service demands increase, so do the costs. These costs were obtained from various local government sources and allocated to new residential development. The model used to estimate costs incurred due to new residential development for a particular fiscal year is presented in Appendix B. Basically, this model allocates increased public sector budgets to an inflation component and to a new service demand component. The former is a function of the Consumer Price Index for the particular group of items such as service, transportation and commodities.

This section deals exclusively with the analysis of the cost of providing additional public services through the Gretna School District, the City of Gretna and Sarpy and Douglas Counties.

a. School costs. The Gretna School District (School District 37) has experienced substantial growth since its consolidation with ten adjacent rural districts in 1957. During the past 15 years 681 students and 41 teachers were added to the District, representing increases of 161 percent and 241 percent respectively (see Tables 12 and 13). Total school

TABLE 10

VALUE OF BUILDING PERMITS AND ESTIMATION OF CONSTRUCTION COSTS
OF COMPACT DEVELOPMENT PATTERN, GRETNA, NEBRASKA, 1965-1975

Fiscal Year	Number of Units	Permit Value[a]		Construction Cost			
				Actual Dollars[b]		Constant Dollars[c]	
		Total	Average	Total	Average	Total	Average
1965-66	4	$ 42,598	$10,650	$ 85,196	$21,299	$ 140,284	$35,071
1966-67	8	84,138	10,517	168,276	21,034	263,806	32,975
1967-68	13	147,491	11,345	294,982	22,690	443,948	34,148
1968-69	2	18,468	9,234	36,936	18,468	52,589	26,295
1969-70	14	152,752	10,911	305,504	21,822	397,400	28,386
1970-71	25	271,038	10,842	542,076	21,683	702,097	28,084
1971-72	75	797,860	10,638	1,595,720	21,276	2,004,703	26,729
1972-73	80	827,746	10,347	1,655,492	20,694	1,968,049	24,601
1973-74	26	262,893	10,111	525,786	20,223	569,689	21,912
1974-75	11	132,044	12,004	264,088	24,008	264,088	24,008
Total	258	$2,737,028	$10,609	$5,474,056	$21,218	$6,806,653	$26,382

[a] Value of single-family building permit was determined by a set of rates: $10.00 per square foot for a frame or brick veneer with basement, including split level, bi-level, etc., $5.00 per square foot for the second story of a full two story, and $9.00 per square foot for a frame or brick veneer without basement.

[b] Current dollar construction costs were estimated through a building permit value and construction cost ratio of 0.50. This ratio was established after consulting building permit inspectors and conducting a sample interview of developers and realtors in Gretna.

[c] The 1975 constant dollar construction costs were obtained through the use of the Price Index of New One-family Houses Sold in North-Central Region of the U.S.A. (Construction Report, U.S. Department of Commerce, Bureau of Census, January, 1976) as an inflator for the back-year construction costs.

Source: Gretna City Clerk.

TABLE 11

VALUE OF BUILDING PERMITS AND ESTIMATION OF CONSTRUCTION COSTS
SCATTERED DEVELOPMENT PATTERN, GRETNA, NEBRASKA, 1965-1975

Fiscal Year	Number of Units	Permit Value[a]		Construction Cost			
				Actual Dollars[b]		Constant Dollars[c]	
		Total	Average	Total	Average	Total	Average
1965-66	8	$ 118,500	$14,813	$ 237,000	$29,625	$ 390,244	$48,781
1966-67	5	66,672	13,334	133,344	26,669	209,043	41,809
1967-68	7	111,640	15,949	223,280	31,897	336,036	48,005
1968-69	5	77,500	15,500	155,000	31,000	220,689	44,138
1969-70	10	153,590	15,359	307,180	30,718	399,580	39,960
1970-71	7	118,360	16,909	236,720	33,817	306,600	43,800
1971-72	17	254,500	14,971	509,000	29,941	639,457	37,615
1972-73	23	383,205	16,661	766,410	33,322	911,108	39,613
1973-74	18	282,440	15,691	564,880	31,382	612,047	34,002
1974-75	9	151,718	16,858	303,436	33,715	303,436	33,715
Total	109	$1,718,125	$15,763	$3,436,250	$31,525	$4,328,240	$39,709

[a] Value of single-family building permit was determined by a flat rate of $10.00 per square foot of building space in Sarpy County for a period between 1959 to 1974. It was raised to $15.00 since January 1975. Value of single-family building permit in Douglas County was determined through a set of rates of $8.50 per square foot for a one story building, $10.00 per square foot for a one and one-half story building and $11.50 per square foot for a two story building from 1965 to March 1976.

[b] Current dollar construction costs were estimated through a building permit and construction cost ratio of 0.50. This ratio was established through consulting with building permit inspectors in both counties and was verified through a sample interview of developers in the area.

[c] Price Index of New One-family House Sold in North-Central Region of U.S.A. (Construction Report, U.S. Department of Commerce, Bureau of Census, January 1976) was used as inflator for the back-year construction costs in order to equate them to 1975 dollars.

Sources: Douglas and Sarpy County Building Permit and Inspection Departments.

TABLE 12

STUDENT ENROLLMENT AND NUMBER OF HOUSEHOLDS OF GRETNA SCHOOL COMMUNITY
BY URBAN AND RURAL AREAS, 1960-1975

School Year	Total[a] Enrollment K-12th Grade	Enrollment by Area				Number of Students Riding School Bus[d]	Number of Households[e]		
		City of Gretna and Fringe[c]		Rural Gretna[b]			City of Gretna and Fringe Area	Rural Area	Total
		Number	Percent	Number	Percent				
1960-61	424	144	34.0	280	66.0	224	201	197	398
1961-62	479	194	40.5	285	59.5	228	250	205	455
1962-63	534	231	43.3	303	56.7	242	297	209	506
1963-64	586	281	48.0	305	52.0	244	344	212	556
1964-65	640	295	46.1	345	53.9	276	391	216	607
1965-66	709	311	43.9	398	56.1	318	395	224	619
1966-67	743	360	48.5	383	51.5	306	403	229	632
1967-68	780	381	48.8	399	51.2	319	416	236	652
1968-69	809	395	48.8	414	51.2	331	424	241	665
1969-70	853	419	49.1	434	50.9	347	438	251	689
1970-71	900	439	48.8	461	51.2	369	463	258	721
1971-72	936	478	54.3	458	49.0	366	538	275	813
1972-73	977	508	52.0	469	48.0	375	618	298	916
1973-74	1,085	591	54.5	494	45.5	395	644	316	960
1974-75	1,091	608	55.7	483	44.3	386	655	323	978
1975-76	1,105	-	-	-	-	-	-	-	-

[a] Sarpy County School Superintendent's Office.

[b] Estimated by number of bus riders during school years. About 80 percent of rural students ride buses, according to Superintendent of Gretna School District.

[c] Derived by subtracting the Rural Gretna estimate from Total Enrollment K-12th Grade.

[d] State Department of Education, Lincoln, Nebraska, Mrs. Lucile Kerr.

[e] Number of households were estimated through information in U.S. Census of Housing, 1960, U.S. Census Of Housing, 1970 and building permit information from Gretna City Clerk & Sarpy County Building Permit Inspection Dept.

TABLE 13

NUMBER OF TEACHERS AND AVERAGE SALARY
OF GRETNA SCHOOL DISTRICT, 1960-1975

	Number of Teachers			Average Salary			Annual Rate of Growth of Average Salary (Percent)
	Elementary	Secondary	Total	Elementary	Secondary	Total	
1960-61	9	8	17	3,389	4,140	3,742	-
1961-62	11	9	20	3,650	4,480	4,024	7.5
1962-63	13	9	22	4,162	5,058	4,629	15.0
1963-64	13	12	25	4,377	5,203	4,773	3.1
1964-65	15	13	28	4,703	5,525	5,085	6.5
1965-66	15	15	30	5,166	5,760	5,463	7.4
1966-67	17	16	33	5,338	5,935	5,627	3.0
1967-68	19	17	36	5,649	6,110	5,867	4.3
1968-69	21	19	40	6,236	7,275	6,730	14.5
1969-70	20	21	41	7,020	7,926	7,484	11.2
1970-71	20	22	42	7,619	8,016	7,827	4.6
1971-72	23	24	47	7,619	8,018	7,822	-0.01
1972-73	20	24	44	8,182	8,733	8,483	8.5
1973-74	25	26	51	8,050	8,570	8,315	-2.0
1974-75	25	29	54	8,780	9,896	9,379	12.8
1975-76	27	31	58	9,549	9,645	9,600	2.3

Data Source: Compiled from data in Nebraska Educational Directory, 1960-61, 1961-62, 1962-63, . . .1975-76, Department of Education, State of Nebraska.

expenditures have increased from $119,926 in fiscal year 1960-61 to $1,004,504 in fiscal year 1974-75, a 737 percent increase. In addition to increased operating expenses, more school buses and more classrooms were needed to meet the expanding demand for school services. This was reflected by the increased transportation costs from $12,498 in 1961 to $47,587 in 1975, and by the increase of annual capital outlays from $31,383 to $955,257 during the same time period (see Table 14).

School costs consisted of three categories: operating costs, transportation costs, and capital costs. Operating costs are those associated with instruction (including teacher salaries), administration, plant maintenance and operation and other fixed charges such as fringe benefits, insurance, and bond premiums. Instruction costs constituted the major portion of the operating costs (64 percent of the operating costs in

TABLE 14

ANNUAL EXPENDITURES OF GRETNA SCHOOL DISTRICT, 1960-1975

School Fiscal Year[a]	Annual Capital Outlay[d]	Annual[b] Total Expenditure	Annual Operating Expenditure	Partition of Operating Expenditure[c]		Transportation Costs	Total Operating and Transportation Costs in Rural Area	Transportation as Percent of Total Operating and Transportation Costs
				City of Gretna and Fringe	Rural Gretna			
1960-61	$ 31,383	$ 119,926	$107,428	$ 36,526	$ 70,902	$12,498	$ 83,400	15.0
1961-62	34,257	140,695	128,142	51,898	76,244	12,553	88,797	14.1
1962-63	39,928	164,861	150,845	65,216	85,529	14,016	99,545	14.1
1963-64	111,300	187,742	171,881	82,503	89,378	15,861	105,239	14.6
1964-65	183,780	216,893	201,573	92,925	108,648	15,320	123,968	12.4
1965-66	56,406	268,544	251,814	110,546	141,268	16,730	157,998	10.6
1966-67	53,882	309,937	291,937	141,589	150,348	18,905	169,253	11.2
1967-68	41,559	350,960	327,913	160,022	167,891	23,047	196,938	12.1
1968-69	154,605	490,903	465,787	227,305	238,482	25,116	262,598	9.5
1969-70	632,817	522,365	490,599	240,884	249,715	31,766	281,481	11.3
1970-71	788,129	635,938	603,725	294,618	309,107	32,213	341,320	9.4
1971-72	195,846	693,077	659,017	336,099	322,918	34,060	356,978	9.5
1972-73	151,357	740,250	717,732	373,221	344,511	22,518	367,029	6.1
1973-74	355,092	847,567	809,980	441,440	368,540	37,587	406,127	9.3
1974-75	955,257	1,004,504	956,917	533,003	423,914	47,587	471,501	10.1

[a] The School Fiscal Year is defined as a year from July 1st of one year to June 30th of the next year. Officially this school fiscal year was changed to September 1st to August 31st.

[b] Annual total expenditures were adjusted to school fiscal year of July 1st - June 30th for the years from 1968-75.

[c] Partition of Operating Expenditure was based upon percentage of school enrollment between the City of Gretna and Fringe, and Rural Gretna (Table 12).

[d] Annual Capital Outlay is not included in Annual Total Expenditure because they are budgeted separately.

Source: Gretna School Superintendent's Office.

school year 1974-75). Since they are mainly a function of annual student enrollment, the allocation of operating costs between the two land development patterns was based upon the proportion of students according to where they live. (See the "Partition of Operating Expenditures" columns in Table 14.)

Transportation costs are those incurred mainly for providing bus services to rural students--those who live in scattered development pattern areas. Thus, they are a function of the number of students living in the rural Gretna area.

Annual capital costs were incurred mainly because of new construction or capital improvement for the expansion of school services. These new projects are financed through bonds, and bond retirement generally begins the third year after the completion of the new construction. Hence, capital outlays are the annual cash outflow for bond retirement in the form of principle, interest and other related costs. During the past 15 years Gretna School District has incurred more than 2.5 million dollars in capital improvement costs including the acquisition of a new 14-acre school plant in 1959 and construction of a new junior and senior high school building in 1974. Because capital outlays have a long range impact, affecting both present and future generations, the analysis of capital outlays and the impact of different housing development patterns was excluded from the school cost analysis.

Table 15 shows the analysis of annual operating costs and transportation costs by major area of the Gretna community. The annual change in both operating costs and transportation costs were divided into two components: that part due to inflation and that part due to increased demand for services (see Appendix B). The former portion was obtained by multiplying the annual change in prices of services by the consumer price index.[5] The latter costs are assumed to be incurred because of the annual increment of new housing units in the area. It should be noted, however, that part of the cost may be due to increased demand for school services.

These increased costs due to increased demand for school services are further analyzed in Table 16. The increased costs for the compact

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[5]Although a general inflation rate has been applied to educational and other costs, salaries--a major component of these budgets--may not have been increased by that rate.

TABLE 15

ANNUAL CHANGE OF OPERATING EXPENDITURES OF GRETNA SCHOOL DISTRICT, GRETNA, NEBRASKA, 1960-1975

Fiscal Year	Annual Change in Total Operating Expenditures						Annual Change in Transportation Expenditure		
	City of Gretna & Fringe			Rural Gretna					
	Total Change	Due to Inflation[a]	Due to Increased Service Demand[c]	Total Change	Due to Inflation[a]	Due to Increased Service Demand[c]	Total Change	Due to Inflation[b]	Due to Increased Service Demand[c]
1961-62	$15,372	$2,739	$12,633	$5,342	$ 5,318	$ 24	$ 55	$ 237	$ 0
1962-63	13,318	7,785	5,533	9,285	11,437	0	1,463	63	1,400
1963-64	17,287	2,022	15,265	3,849	2,651	1,198	1,845	182	1,663
1964-65	10,422	5,363	5,059	19,270	5,810	13,460	-541	253	0
1965-66	17,621	6,876	10,745	32,620	8,040	24,580	1,410	199	1,211
1966-67	31,043	3,316	27,727	9,080	4,238	4,842	2,175	468	1,707
1967-68	18,433	6,088	12,345	17,543	6,465	11,078	4,142	604	3,538
1968-69	67,283	23,203	44,080	70,591	24,344	46,247	2,069	922	1,147
1969-70	13,579	25,458	0	11,233	26,710	0	6,650	1,381	5,269
1970-71	53,734	11,081	42,653	59,392	11,487	47,905	447	1,874	0
1971-72	41,481	0	41,481	13,811	0	13,811	1,847	419	1,428
1972-73	37,122	28,568	8,554	21,593	27,448	0	-11,542	1,328	0
1973-74	68,219	0	68,219	24,029	0	24,029	15,069	3,130	11,939
1974-75	91,563	56,504	35,059	55,374	47,173	8,201	10,000	3,645	6,355

[a] Change of Expenditures Due to Inflation was obtained by multiplying the annual rate of salary increase (Table 13) by the annual operating expenditures of the City of Gretna and Fringe and Rural Gretna (Table 14).

[b] Change of Transportation Expenditures Due to Inflation was obtained by multiplying the Consumer Price Index of Transportation (Appendix B) by Annual Transportation Expenditures (Table 14).

[c] Change Due to Increased Service Demand results from subtracting Change Due to Inflation from Total Annual Change.

Source: Gretna School Superintendent's Office. (See Tables 12 and 14).

TABLE 16

INCREASED COSTS DUE TO INCREASED DEMAND FOR SCHOOL SERVICES BY DEVELOPMENT PATTERN, 1965-1975

	Compact Development Pattern					Scattered Development Pattern				
	Number of Units	Actual Dollars		Constant Dollars[a]		Number of Units	Actual Dollars		Constant Dollars[a]	
		Total	Average	Total	Average		Total[b]	Average	Total	Average
1965-66	4	$10,745	$2,686	$17,611	$4,403	8	$25,791	$3,224	$42,271	$5,284
1966-67	8	27,727	3,466	44,169	5,521	5	6,549	1,310	10,433	2,087
1967-68	13	12,345	950	18,876	1,452	7	14,616	2,088	22,348	3,193
1968-69	2	44,080	22,040	63,960	31,980	5	47,394	9,479	68,769	13,754
1969-70	14	0	0	0	0	10	5,269	527	7,219	722
1970-71	25	42,653	1,706	56,003	2,240	7	47,905	6,844	62,899	8,986
1971-72	75	41,481	553	52,722	703	17	15,239	896	19,369	1,139
1972-73	80	8,554	107	10,239	128	23	0	0	0	0
1973-74	26	68,219	2,624	73,540	2,828	18	35,968	1,998	38,774	2,154
1974-75	11	35,059	3,187	35,059	3,187	9	14,556	1,617	14,556	1,617
Total	258	$290,863	$1,127	$372,179	$1,443	109	$213,287	$1,957	$286,638	$2,630

[a] Constant Dollar costs were obtained by applying the Consumer Price Index (U.S. Statistical Abstract, 1975) to the Actual Dollar costs.

[b] Total Actual Dollar costs include both operating and transportation expenditures.

Sources: Compiled from data obtained from Gretna School Superintendent's Office, Gretna City Clerk's Office and Sarpy County Building Permit Inspector.

development pattern consists of operating costs only, while those for the scattered development pattern include both operating costs and transportation costs. Increases in per unit costs for the scattered development pattern, both in actual and in 1975 constant dollars, are nearly twice those for the compact development pattern. At the same time it should be noted that the value of the units in the scattered development pattern is considerably higher than the value in the compact development pattern, thus generating more tax dollars per unit.

b. General governmental expenditures. General governmental expenditures are the residual portion of the Sarpy County General Fund after expenditures for the County Superintendent of Schools and County Sheriff are excluded. Expenditures of the County Superintendent were not applicable to the Gretna School District and expenditures of the County Sheriff were grouped separately as police expenditures. Table 17 shows the breakdown of

TABLE 17

OPERATING EXPENDITURES AND SPECIAL ROAD FUND
SARPY COUNTY, NEBRASKA, 1960-1975

Fiscal Year	Operating Expenditures				Special[a/] Road Fund
	General Government	County Sheriff	County Superintendent	Total	
1960-61	$ 222,008	$ 23,483	$11,900	$ 257,392	$135,587
1961-62	232,914	28,217	9,977	271,107	32,780
1962-63	262,541	30,235	7,286	300,062	58,750
1963-64	304,149	46,791	7,494	358,434	77,851
1964-65	337,648	50,566	7,609	380,605	109,412
1965-66	352,606	58,324	7,226	418,156	145,726
1966-67	376,431	66,154	7,201	449,786	52,741
1967-68	437,084	81,370	7,292	525,746	166,822
1968-69	462,084	83,649	7,552	553,285	298,353
1969-70	516,372	106,595	8,079	631,046	298,317
1970-71	752,323	122,132	7,580	882,034	533,238
1971-72	886,962	162,855	10,699	1,060,516	580,783
1972-73	1,126,126	183,050	10,031	1,319,243	657,657
1973-74	1,226,929	263,593	9,863	1,500,384	714,420
1974-75	1,905,294	369,815	12,250	2,287,359	921,165

[a/] Capital outlay was excluded from the County Special Road Fund.

Source: Sarpy County Clerk's Office.

total general funds and special road funds of Sarpy County government; Table 18 shows the operating budget of the City of Gretna and the Gretna Fire District. General governmental expenditures consisted of administrative expenses such as personnel salaries, office supplies and other miscellaneous expenses. They were incurred proportionately to the magnitude of demand for public services of Sarpy County residents. Hence, each resident of Sarpy County should have an equal share of these expenditures while the general governmental expenditures of the City of Gretna were paid by residents of Gretna only.[6] Table 19 shows the allocation of governmental expenditures among residents by area of residence; while Table 20 presents the analysis of general governmental expenditures by different land development patterns.[7] Average general governmental costs per housing unit for the compact development pattern were $401; twice the $192 amount for scattered development pattern, in 1975 constant dollars.

c. Police costs. Police costs were those budgeted to the Office of the County Sheriff in Sarpy County and to the Police Department in the City of Gretna. As population increases, so does the incidence of crime and the demand for more police protection. This was shown by the annual increase of police expenditures for the Office of the County Sheriff and the Gretna Police Department (Tables 17 and 18). The County Sheriff patrols all County roads and assists the police departments in small communities such as Gretna in case of crimes committed. Gretna police provide protection to residents of the City and its fringe area. Thus, theoretically speaking, residents of the City of Gretna get double police protection. Residents of the City of Gretna, however, pay for the police protection received from the County Sheriff's Office, as reflected in the property tax (mill levy) for the Sarpy County Government in addition to that for

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[6]Residents living in rural Gretna do use Gretna City facilities such as parks, swimming pools, roads and streets, library, etc. while they do not pay City taxes for maintaining and operating these facilities. Thus, their portion of the general governmental expenditures was generally understated.

[7]Government expenditures, police costs, street and road costs and fire costs were not estimated for the portion of Gretna School District in Douglas County. Nine housing units were built in the area within the past ten years but the impact per year of this increased demand for services was considered to be insignificant.

TABLE 18

OPERATING EXPENDITURES OF CITY OF GRETNA AND
GRETNA FIRE DISTRICT, 1965-1975

Fiscal Year	General Government	Police	Fire	Utilities and Telephone	Recreation Maintenance Only	Others[a/]	Total General Funds	Street and Road	Fire District
1964-65	NA	$ 861	$ 1,314	$ 2,036	$ 725	$ 1,923	---	$ 2,883	$ 900
1965-66	$ 15,469	1,050	1,000	2,500	0	0	$ 20,019	4,000	1,000
1966-67	21,860	1,280	1,000	2,500	0	0	26,640	4,000	1,100
1967-68	27,431	1,560	1,176	1,150	3,000	500	34,817	5,500	1,300
1968-69	36,557	1,902	1,355	4,639	1,517	5,256	51,226	8,256	1,500
1969-70	44,043	1,404	1,533	4,164	5,879	6,504	63,527	11,011	1,500
1970-71	49,229	1,799	1,710	4,342	10,941	7,477	75,498	26,082	1,500
1971-72	67,878	2,194	1,824	4,918	4,727	7,836	89,377	55,600	1,400
1972-73	79,068	3,209	1,936	4,017	8,389	7,969	104,588	38,400	1,800
1973-74	96,657	5,574	2,118	3,320	4,468	8,863	121,000	48,000	2,100
1974-75	104,150	10,500	2,300	4,000	3,900	10,100	134,950	38,900	2,400

[a/] Others include expenditures for gas, oil, solid waste collection and library, etc.

Sources: City Clerk's Office, Gretna, Nebraska, and Fire Chief's Office, Gretna, Nebraska.

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TABLE 19

ANALYSIS OF GENERAL GOVERNMENTAL COSTS
SARPY COUNTY AND CITY OF GRETNA, NEBRASKA

Fiscal Year	Sarpy County					City of Gretna		
	Total Change	Due to Inflation[a]	Due to Increased Demand	Due to Demand in City of Gretna and Fringe[b]	Due to Demand in Rural Gretna[c]	Total Change	Due to Inflation[a]	Due to Increased Demand
1961-62	$ 10,906	$ 3,552	$ 7,354	$ 196	$ 175	NA	---	---
1962-63	29,627	3,960	25,667	739	567	NA	---	---
1963-64	41,608	4,463	37,145	1,133	765	NA	---	---
1964-65	33,499	6,083	27,416	877	532	NA	---	---
1965-66	14,958	12,155	2,803	84	54	---	---	---
1966-67	23,825	14,809	9,016	256	160	$ 6,391	$ 650	$ 5,741
1967-68	60,653	19,574	41,079	1,126	707	5,571	1,137	4,434
1968-69	25,000	31,907	0	0	0	9,126	2,002	7,124
1969-70	54,288	42,050	12,238	312	199	7,486	3,327	4,159
1970-71	235,951	35,113	200,838	4,900	3,213	5,186	2,994	2,192
1971-72	134,639	36,864	97,775	2,298	1,535	18,649	2,412	16,237
1972-73	239,164	51,444	187,720	4,824	2,985	11,190	3,937	7,253
1973-74	100,803	145,270	0	0	0	17,589	10,200	7,389
1974-75	678,365	153,366	524,999	14,017	7,822	7,493	12,082	0

[a] Obtained by multiplying index of service group of Consumer Price Index to annual general governmental expenditures of the preceeding year.

[b] Obtained by multiplying "Due to Increased Demand" by proportion of population in City of Gretna Fringe and Rural Gretna respectively.

Sources: Compiled from data from County Clerk's Office, Sarpy County; City Clerk's Office, Gretna, Nebraska.

TABLE 20

GOVERNMENTAL COSTS BY LAND DEVELOPMENT PATTERN
GRETNA, NEBRASKA, 1965-1975

	Compact Development Pattern					Scattered Development Pattern				
	No. of Units	Actual Dollars		Constant Dollars		No. of Units	Actual Dollars		Constant Dollars	
		Total	Average	Total	Average		Total	Average	Total	Average
1965-66	4	NA	-	NA	-	8	NA	-	-	-
1966-67	8	$ 5,997	$ 750	$ 9,229	$1,154	4	$ 160	$ 40	$ 255	$ 64
1967-68	13	5,560	428	8,501	654	6	707	118	1,081	180
1968-69	2	7,124	3,562	10,337	5,168	5	0	0	0	0
1969-70	14	4,471	319	6,125	438	9	199	22	273	30
1970-71	25	7,092	284	9,312	372	5	3,213	643	4,219	844
1971-72	75	18,535	247	23,558	314	17	1,535	90	1,951	115
1972-73	80	12,077	151	14,456	181	22	2,985	136	3,573	162
1973-74	26	7,389	284	7,965	306	17	0	0	0	0
1974-75	11	14,017	1,274	14,017	1,274	7	7,822	1,117	7,822	1,117
Total	258	$82,262	$ 319	$103,500	$ 401	100	$16,621	$ 166	$19,174	$ 192

Sources: Compiled from data from County Clerk's Office, Sarpy County Courthouse, and City Clerk's Office, City of Gretna.

the City of Gretna. Table 21 shows the analysis of police costs among residents of rural Gretna and in Gretna City and its fringe. Table 22 presents the comparison of police costs between development patterns. Residents associated with the compact development pattern paid an average of $62 (in 1975 constant dollars) which was about 50 percent higher than the amount paid by residents associated with the scattered development pattern.

d. Streets and roads costs. Street and road costs were expenditures budgeted for special road funds in both Sarpy County and the City of Gretna governments. They consisted of expenditures for personal services, operating and maintenance, supplies and materials, equipment and traffic control.[8] In the analysis of street and road costs, expenditures in the City of Gretna were allocated to residents of the City and its fringe; those incurred in Sarpy County were allocated to residents of rural Gretna as well as to Gretna residents. This is shown in Table 23. Table 24 shows the computation of street and road costs between different development patterns both in current dollars and in 1975 constant dollars. Residents associated with the compact development pattern paid an average of $371 in street and road costs; more than twice the amount paid by residents associated with scattered developments.

e. Fire costs. The Gretna Fire District provides fire protection services for the Sarpy County portion of rural Gretna and the Gretna Fire Department for the City of Gretna. Their costs consist mainly of expenditures for personal services, operation and maintenance and supplies. Since most of the firemen were volunteers, budgets for both the Gretna Fire District and the Gretna Fire Department were relatively small and stable (1.25 mill for the Gretna Fire District in 1975; see Table 18). Table 25 shows the analysis of fire costs for Gretna Fire District and the Fire Department of the City of Gretna, and Table 26 presents the comparison of fire costs by different land development patterns. The per unit fire cost for residents in compact developments was only two dollars while per unit fire cost for residents in scattered developments was $11.

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[8]Capital outlays for street and roads were excluded from cost analysis for the same reason discussed in Section (a).

TABLE 21

ANALYSIS OF POLICE EXPENDITURES, CITY OF GRETNA AND SARPY COUNTY, NEBRASKA, 1962-1975

Fiscal Year	Sarpy County					City of Gretna		
	Total Change	Due to Inflation[a]	Due to Increased Demand	Due to Demand in City of Gretna and Fringe[b]	Due to Demand in Rural Gretna[c]	Total Change	Due to Inflation[a]	Due to Increased Demand
1961-62	$ 4,734	$376	$ 4,358	$ 116	$ 103	NA	-	-
1962-63	2,018	480	1,538	44	34	NA	-	-
1963-64	16,556	514	16,042	489	330	NA	-	-
1964-65	3,775	936	2,839	91	55	-	-	-
1965-66	7,758	1,820	5,938	179	111	$ 189	$ 31	$ 158
1966-67	7,830	2,450	5,380	153	96	230	44	186
1967-68	15,216	3,440	11,776	323	203	280	66	214
1968-69	2,279	5,940	0	0	0	342	138	204
1969-70	22,946	7,612	15,334	391	250	-498	0	0
1970-71	15,537	7,248	8,289	202	133	395	95	300
1971-72	40,723	5,984	34,739	816	545	395	88	307
1972-73	20,195	9,446	10,749	276	171	1,015	127	888
1973-74	80,543	23,613	56,930	1,571	888	2,365	413	1,952
1974-75	106,222	32,949	73,273	1,956	1,092	4,926	697	4,229

[a] Obtained by multiplying index of service group of consumer price index to annual police expenditure of the preceeding year.

[b] Obtained by multiplying "Due to Increased Demand" to proportions of population in the City of Gretna and Fringe and in Rural Gretna respectively.

[c] Same as above.

Sources: Compiled from data from Sarpy County Clerk's Office and Gretna City Clerk's Office.

TABLE 22

POLICE EXPENDITURES BY DEVELOPMENT PATTERN,
GRETNA NEBRASKA, 1965-1975

Fiscal Year	Compact Development Pattern					Scattered Development Pattern				
	No. of Units	Actual Dollars		Constant Dollars		No. of Units	Actual Dollars		Constant Dollars	
		Total	Average	Total	Average		Total	Average	Total	Average
1965-66	4	$ 337	$ 84	$ 552	$138	8	$ 111	$ 14	$ 182	$ 23
1966-67	8	339	42	522	65	4	96	24	153	38
1967-68	13	537	41	821	63	6	203	34	310	52
1968-69	2	204	102	296	148	5	0	0	0	0
1969-70	14	391	28	536	38	9	250	28	343	38
1970-71	25	502	20	659	26	5	133	27	175	35
1971-72	75	1,123	15	1,427	19	17	545	32	693	41
1972-73	80	1,164	15	1,393	17	22	171	8	205	9
1973-74	26	3,523	136	3,798	146	17	888	52	957	56
1974-75	11	6,185	562	6,185	562	7	1,092	156	1,092	156
Total	258	$14,305	$ 55	$16,089	$ 62	100	$3,489	$ 35	$4,110	$ 41

Sources: Compiled from data from Sarpy County Clerk's Office and Gretna City Clerk's Office.

TABLE 23

ANALYSIS OF HIGHWAY AND ROAD COSTS
SARPY COUNTY AND CITY OF GRETNA, NEBRASKA, 1962-1975

Fiscal Year	Sarpy County					City of Gretna		
	Total Change	Due to Inflation[a]	Due to Increased Demand	Due to Demand in City of Gretna and Fringe[b]	Due to Demand in Rural Gretna[b]	Total Change	Due to Inflation[a]	Due to Increased Demand
1961-62	$ -102,807	$ 2,576	0	0	0	NA	---	---
1962-63	25,970	164	$ 25,806	$ 743	$ 570	NA	---	---
1963-64	19,101	764	18,337	559	378	NA	---	---
1964-65	31,561	1,246	30,315	970	588	---	---	---
1965-66	36,314	1,422	35,139	1,051	657	$ 1,117	$ 37	$ 1,080
1966-67	- 92,985	4,080	0	0	0	0	0	0
1967-68	114,081	1,688	112,393	3,080	1,933	1,500	128	1,372
1968-69	131,531	6,673	124,858	3,271	2,073	2,756	220	2,536
1969-70	- 36	16,409	0	0	0	2,755	454	2,301
1970-71	234,921	17,601	217,320	5,303	3,477	15,071	650	14,421
1971-72	47,545	6,932	40,613	954	638	29,520	339	29,181
1972-73	76,874	22,651	54,223	1,394	862	-17,200	0	0
1973-74	56,763	91,414	0	0	0	9,600	5,338	4,262
1974-75	197,745	69,299	128,446	3,430	1,914	- 9,100	0	0

[a] Obtained by multiplying Index of Transportation group of Consumer Price Index, U.S.A. by Annual Highway and Road Expenditures of the preceeding year.

[b] Obtained by multiplying "Change Due to Increased Demand" by proportion of population in Gretna City and Fringe and Rural Gretna respectively.

Sources: Compiled from data from Sarpy County Clerk's Office; Gretna City Clerk's Office.

TABLE 24

HIGHWAY AND ROAD COSTS BY DEVELOPMENT PATTERN, GRETNA, NEBRASKA 1965-1975

Fiscal Year	Compact Development Pattern					Scattered Development Pattern				
	Number of Units	Actual Dollars		Constant Dollars		Number of Units	Actual Dollars		Constant Dollars	
		Total	Average	Total	Average		Total	Average	Total	Average
1965-66	4	$ 2,131	$ 533	$ 3,493	$ 873	8	$ 657	$ 82	$ 1,077	$135
1966-67	8	0	0	0	0	4	0	0	0	0
1967-68	13	4,452	342	6,807	524	6	1,933	322	2,956	493
1968-69	2	5,807	2,904	8,426	4,213	5	2,073	415	3,008	602
1969-70	14	2,301	164	3,152	225	9	0	0	0	0
1970-71	25	19,724	789	25,898	1,036	5	3,477	695	4,565	913
1971-72	75	30,135	402	38,302	511	17	638	38	811	48
1972-73	80	1,394	17	1,669	21	22	862	39	1,032	47
1973-74	26	4,262	164	4,594	177	17	0	0	0	0
1974-75	11	3,430	312	3,430	312	7	1,914	273	1,914	273
Total	258	$73,636	$ 285	$95,671	$ 371	100	$11,554	$116	$15,363	$154

Sources: Compiled from data from the offices of the Sarpy County Clerk and Gretna City Clerk.

TABLE 25

ANALYSIS OF FIRE COSTS
GRETNA FIRE DISTRICT AND CITY OF GRETNA, NEBRASKA, 1965-1975

Fiscal Year	Gretna Fire District			City of Gretna		
	Total Change	Due to Inflation	Due to Increased Demand	Total Change	Due to Inflation	Due to Increased Demand
1964-65	NA	NA	NA	NA	NA	NA
1965-66	$100	$32	$68	$-314	0	0
1966-67	100	42	58	0	0	0
1967-68	200	57	143	176	$52	$124
1968-69	200	95	105	179	86	93
1969-70	0	0	0	178	123	55
1970-71	0	0	0	177	104	73
1971-72	-100	0	0	114	84	30
1972-73	400	81	319	112	105	7
1973-74	300	232	68	182	250	0
1974-75	300	262	38	182	264	0

Source: Compiled from data from Gretna City Clerk's Office and Gretna Fire Chief's Office.

TABLE 26

FIRE COSTS BY DEVELOPMENT PATTERN
GRETNA, NEBRASKA, 1965-1975

Fiscal Year	Compact Pattern					Scattered Pattern				
	Number of Units	Actual Dollar		Constant Dollar		Number of Units	Actual Dollar		Constant Dollar	
		Total	Average	Total	Average		Total	Average	Total	Average
1965-66	4	0	0	0	0	8	$ 68	$ 9	$111	$14
1966-67	8	0	0	0	0	4	58	15	92	23
1967-68	13	$124	$10	$190	$15	6	143	24	219	36
1968-69	2	93	47	135	67	5	105	21	152	30
1969-70	14	55	4	75	5	9	0	0	0	0
1970-71	25	73	3	83	3	5	0	0	0	0
1971-72	75	30	0	38	1	17	0	0	0	0
1972-73	80	7	0	8	0	22	319	15	382	17
1973-74	26	0	0	0	0	17	68	4	73	4
1974-75	11	0	0	0	0	7	38	5	38	5
Total	258	$382	$ 1	$529	$ 2	100	$799	$ 8	$1,067	$11

Source: Compiled from data from Gretna City Clerk's Office and Gretna Fire Chief's Office.

Social and environmental costs.

Social and environmental costs are generated by new land development in rural communities. Most of these costs, however, are not measurable because no market value can be attached to such things as the increase of air and water pollution, wildlife destruction, increase of crime rates and health hazards. In the case of land development in Gretna, the following social and environmental effects have been observed:

a. Increase in the crime rate. Interviews with the Gretna City Police and Sarpy County Sheriff indicate the incidence of crime has been up both in the City of Gretna and its surrounding rural area since the late 1960's. Burglaries and vandalism constitute a major portion of these incidences. These officials reported that the increase of crime incidences was relatively greater in rural Gretna (scattered development pattern) for the simple fact that most of the new housing units are sparsely located and poorly served by police forces.

b. Problems of sanitation and health hazards. Over 60 percent of the new housing units of the scattered development pattern in rural Gretna have their own individual septic tanks and wells. Failures of these systems have caused sanitation problems and health hazards. The conventional septic tank system has two components: a septic tank, used to provide partial treatment of the raw waste, and the soil absorption field or pit for final treatment and disposal of the liquid discharged from the septic tank. The system has a high tendency to fail. Failure occurs because of poor system design, faulty installation, inadequate maintenance or unsuitable soils. When failure occurs, usually because of a clogged soil absorption field, septic tank effluent can spread over the ground surface or sewage can back up through the plumbing into the dwelling. Children and pets can easily come in contact with the seepage. It may also enter and contaminate surface waterways. A more serious type of failure occurs when the soil in which the drain field is laid is unable to purify the septic tank effluent before it reaches the groundwater. Contamination of nearby house wells by bacteria, viruses and chemical pollutants can result. This type of failure often goes unnoticed until illnesses occur. The potential problems of sanitation and health hazards from septic tanks multiply as the density of housing units increases.

During the past several years many instances of septic tank failures

have been observed in rural Gretna, according to the Sarpy County building inspector.

c. Exposure to natural hazards. Residents of rural Gretna tend to have wider exposure to natural hazards such as strong wind storms, blizzards and tornadoes simply because they don't have early warning siren systems. These could save lives and diminish the damage when natural hazards occur.

Scattered development incurs higher costs for the delivery of similar amounts of medical and police service than for residents living in the compact development pattern.

d. Wildlife destruction. Rural Sarpy and Douglas Counties have three main classes of wildlife: openland wildlife, woodland wildlife and wetland wildlife.[9] Openland wildlife are those birds such as ring-necked pheasant, bobwhite quail, dove and mammals such as red fox and coyote that normally make their homes in cropland, pasture, meadow, lawn and shrubby plants. Woodland wildlife are those birds such as wild turkey and mammals such as fox squirrel, gray squirrel, white-tailed deer, racoon and opossum that make their homes in areas with trees, shrubs and mixtures of both. Wetland wildlife are those birds such as ducks, geese, herons and shore birds and mammals such as mink, muskrat and beaver that make their homes in ponds, marshes, swamps and similar wet areas. Adequate habitat along with food and water is the key to wildlife abundance. When land development converts upland and woodland into residential lots it destroys that habitat. Since a scattered development pattern uses as much as ten times the farmland or woodland as does a compact development pattern for a single-family housing unit, one may conclude that scattered development is more destructive to wildlife simply because it takes away more of its food, water and shelter.

e. Loss of food production. Land development is a process of converting land from agricultural use to nonagricultural use. During the past 15 years, approximately 617 acres of farmland were converted into residential use in rural Gretna by the construction of only 116 single-family housing units. If the same number of housing units had been built either within the City of Gretna or its fringe area, 35 acres would have been needed, a

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[9]Soil Survey, Douglas and Sarpy Counties, Nebraska, U.S. Department of Agriculture, Soil Conservation Service, University of Nebraska, Conservation and Survey Division. 1973.

saving of 582 acres of farmland. The loss of 582 acres of farmland due to a scattered development pattern over a compact development pattern represents a loss of 33,384 bushels of corn and 8,218 bushels of soybeans, or a total of 41,602 bushels of grain in 1975.[10]

Cost Comparison and Test of Hypothesis

This section presents a comparison of total development costs resulting from the analysis made in the preceding sections and a test of the hypothesis to see whether there is a significant difference in development costs between different land development patterns. Table 27 summarizes and compares economic costs per housing unit--i.e., private and public costs--between the compact and scattered development patterns. It can be seen from Table 27 that per unit total private costs, including costs of building lots and building construction, was $52,388 (1975 constant dollars) for the scattered development pattern and $31,039 for the compact development pattern. This indicates that private per unit cost for the scattered development pattern was 68.8 percent ($21,349) higher than that for the compact development pattern. Two items of private costs were compared, both of them for the scattered development pattern were significantly higher (ranging from 51 percent to 172 percent) than their counterparts for the compact development pattern.

Five categories of public costs were analyzed and compared, namely: schools, general government, streets and roads, and police and fire services. Per unit school and fire costs were higher for the scattered development pattern, while the reverse was true for general government, streets and roads and police costs. The conclusion is that there is no significant difference in per unit public costs between scattered development and compact development (see Table 27).

Table 28 shows a comparison of social and environmental costs by land development patterns. Since no quantitative values were obtained either because they were not identifiable or not available, cost and statistical analysis could not be performed. Only qualitative statements were made. By looking at the table, however, one may conclude that a scattered

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[10]According to 1969 Nebraska Agricultural Statistics, about 60 percent of Sarpy County's farmland was in corn crop and 40 percent in soybeans. The average yield per acre of corn was 95.6 bushels and the average yield per acre of soybeans was 35.3 bushels.

TABLE 27

COMPARISON OF RESIDENTIAL DEVELOPMENT COSTS AND TEST OF HYPOTHESIS

Category	(1) Per Unit Costs in Constant 1975 Dollars: Compact Development Pattern	(2) Per Unit Costs in Constant 1975 Dollars: Scattered Development Pattern	(2)-(1) Difference: Per Unit	(2)-(1) Difference: Percent
Private Costs				
Building Lot	$ 4,657	$12,679	$ +8,022	172.3
Construction	26,382	39,709	+13,327	50.5
Sub-total	$31,039	$52,388	$+21,349	68.8
Public Costs				
School	$ 1,443	$ 2,630	$ +1,187	82.3
General Government	401	192	-209	108.9
Street and Road	371	154	-217	58.5
Police	62	41	-21	51.2
Fire	2	11	+9	450.0
Sub-total	$ 2,279	$ 3,028	$ +749	32.9

$t = \bar{x} / \sqrt{s^2/n} = 0.5687$ with 4 d.f.

where: $\bar{x}$ (mean difference) = $149.80

s^2 (variance of difference) = 347,015

n (number of observations) = 5

$t_{.025}$ (theoretical t-value at five percent significance level) = 2.776

development pattern tends to generate more social and environmental costs in terms of higher crime rates, more exposure to natural hazards, more health and sanitation problems, greater wildlife destruction and food reduction.

TABLE 28

COMPARISON OF SOCIAL AND ENVIRONMENTAL COSTS BY DEVELOPMENT PATTERN

Category	Compact Development Pattern	Scattered Development Pattern
Crime	Lower	Higher
Natural Hazards	Less	Greater
Health and Sanitation	Better	Poor
Air, Water and Noise Pollution	Less	Higher
Wildlife Destruction	Less	Greater
Food Reduction	Less	Greater

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Summary

During the past one and one-half decades the Gretna area has undergone rapid land use development. Two development patterns have emerged in this process: the compact development pattern in Gretna and its fringe area and the scattered development pattern in the Gretna rural area. This study has analyzed the private and public costs associated with each of these development patterns. In summary, the major findings are:

1. During the past one and one-half decades, population in the City of Gretna and its one-mile extra-territorial jurisdiction (Gretna fringe) increased from 745 in 1960 to 2,156 in 1975, a 189.4 percent increase in 15 years.

2. During the same time period, 454 new housing units were built in Gretna and its fringe, an amount equal to twice the total number of housing units in 1960.

3. Population in rural Gretna, an area of about 80 square miles comprising the rural portion of the Gretna community, increased from 790 in 1960 to 1,201 in 1975.

4. The compact development pattern comprised about 225 acres with 454 new housing units located within five subdivisions. The scattered development pattern consists of six subdivisions and 53 individual home sites with a total of 617 acres and 116 new housing units.

5. The average size of a building lot in the scattered development pattern was estimated at 2.60 acres, about ten times as large as the average size of a building lot in the compact development pattern.

6. While all the residents of the compact developments have the advantage of using the City of Gretna's water and sewer systems, residents living in the scattered development pattern have community-owned (through

the SID mechanism) water and sewer systems or have built their own wells and septic tanks. An estimated 80 septic tanks and 73 wells were privately built in rural Gretna in the past ten years.

7. Total private development costs of housing units averaged $52,388 in 1975 dollars for the scattered development pattern compared to $31,039 in the compact development pattern. The higher private development costs for the scattered development were attributed mainly to three factors: larger building lots, greater floor area and individual wells and sewage disposal systems. The cost differentials ranged from 50.15 percent for home construction to 172.3 percent for building lot acquisition and preparation.

8. Residents of the scattered developments paid from ten to 25 mills less property taxes than did residents living in the compact development pattern. In 1975 a resident with a $30,000 home in the City of Gretna paid $1,196.90 in property taxes while a rural resident with a similarly valued house paid only $927.60; a difference of $269.30.

9. Residents in the scattered developments generated an average of $2,630 per household in school costs; 82.3 percent higher than per household costs for residents in the compact development pattern. The higher school costs were attributed mainly to transportation expenditures incurred because of the extra bus service required for children of families living in the scattered development pattern. Yet, families in both pay the same school tax.

10. The loss of food production, as one aspect of the social and environmental costs associated with the scattered development pattern, was significant. Production of an estimated 211 bushels of wheat and 52 bushels of soybeans, or a total of 263 bushels of food grain were lost for each house built in the scattered pattern over the compact development pattern.

Conclusions

The major purpose of the study was to test the hypothesis that costs are higher with a scattered development pattern than with a compact development pattern. The study's conclusions relative to this hypothesis in the Gretna situation are:

1. Private costs per housing unit were significantly higher for the scattered development pattern than for the compact development pattern. In the main these costs reflect owner preferences: a larger lot and a larger home. Secondarily they reflect the higher costs of individual water supply systems (wells) and sewage disposal systems (septic tanks and field drain tile), and, where new streets are opened, the greater amount of street improvements per housing unit.

2. School and fire protection costs per housing unit were higher for the scattered development pattern than for the compact development pattern. The reverse was true for the other public costs measured: general government, streets and roads and police protection. However, as stated in Chapter IV, these costs are understated to the extent residents of the scattered development pattern use the City of Gretna's streets and roads, parks and playgrounds and other public services and facilities, the cost of which is borne solely by Gretna residents.

3. The spill-over effects in terms of social and environmental costs were higher for the scattered development pattern than for the compact development pattern. Crime was reported to have increased in the scattered development pattern more than in the compact development pattern. There were greater health hazards--because of the widespread use of septic tanks--and greater exposure to natural hazards in the scattered development pattern.

4. The scattered development pattern, because it consumed land at approximately ten times the rate of the compact development pattern, had a much greater adverse impact on the natural environment and on food production. The adverse impact on food production was further aggravated by the fact that most of the scattered development occurred in the areas with the best agricultural soils to the north, east and south of Gretna.

Implications

The Gretna experience demonstrates rather dramatically that many people are willing to pay a very substantial premium in terms of private development costs for the privilege of living in a rural setting in a large home on a large lot. The average private development cost of a housing unit in the scattered development pattern was almost 70 percent higher than the average cost in the compact development pattern. It can be inferred

from the Gretna experience, therefore, that growing rural communities can expect pressures of the scattered development type.

Coupled with growth of the scattered development type, however, are a number of hidden indirect costs--or "externalities," as the economists call them--which must be borne by the community and area as a whole.

1. Residents of scattered developments to some extent get a free ride on services and facilities provided by the municipal government (e.g., parks, swimming pool and library). This is not reflected in taxes paid for by residents in the scattered development patterns and therefore produces an economic incentive for growth of the scattered development type.

2. Residents of scattered developments receive the major direct benefit of some services paid for in large part by city residents (e.g., services of the sheriff, snow removal and county roads). This again provides an economic incentive for growth of the scattered development type.

3. School children residing in the compact development patterns generally walk to school, those in the scattered development are bused The cost of that busing falls on persons not only living in scattered development but on those residing in compact developments as well. This again provides an economic incentive for growth of the scattered development type.

In conclusion, although private development costs of scattered development is on the average much higher than for comparable development of the compact type, those who seek to live in scattered developments pay far less than what the real cost of such development is to the community and area as a whole. Some costs can be imputed while other costs do not lend themselves to measurement. These costs nevertheless are important real costs (i.e., impact on environment and food production capacity). However, these costs can be lessened through planning and zoning controls by restricting development in the best agricultural soils and directing it to areas best suited environmentally for it.

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APPENDIXES

APPENDIX A

REGIONAL DEVELOPMENT AND LAND USE PLANNING

For the past 15 years, Gretna has been undergoing rapid urbanization, reflected in growth of population and in housing development. With more farm land converted to non-agricultural uses, the agricultural industry has lost its dominance in Gretna's economy. What are the causes for this rapid urbanization? Does this have anything to do with Gretna's location relative to the Omaha metropolitan area? Do other small towns have similar growth patterns? How should the local government respond in the interest of the community? This appendix examines the theoretical bases of regional development and urbanization, and attempts to find proper answers for these questions.

The Growth-Point Concept--A Dynamic Regional Development Model

The growth-point concept originated in works of several eminent economists as an explanation of the relationship between an established metropolitan center and its peripheral communities.[11] The fact that economic growth proceeds more rapidly near major urban centers or points indicates the existence of two economic multiplier effects or spread effects of these urban centers. First, new industries tend to agglomerate near established industries, in or near major urban centers. The establishment of new firms in turn creates more job opportunities. Second, industrial input markets such as investment capital and manpower operate more efficiently in and near urban centers. For example, information about new job opportunities is more complete near or in urban centers. Workers easily shift to better-paying jobs and capital easily shifts to investments with better payoffs.

Other more obvious changes in lifestyle increase the attractiveness of smaller communities for urban dwellers. Changes in transportation

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[11] The growth-point concept originated in the work of Francois Perroux (1950) and was modified by Parr (1965), Friedmann (1966), Hansen (1968), Nichols (1968) and Lasuen (1969).

technology and the construction of arterial highways have reduced the time span and cost of commuting between residence and employment. Rising family incomes have partially offset rising costs of fuel. Suburban living offers open spaces without sacrificing the wide selection of goods and services available in urban centers.

In the absence of an operational spatial model, the growth-point concept has become increasingly popular among city planners and private investors in determining what locations have the greatest growth potential. The concept can describe both an observed condition and an instrument of planning policy. Once points (places) exhibiting vigorous growth are observed, policies can be formulated for further planned growth or for an optimum spatial arrangement.

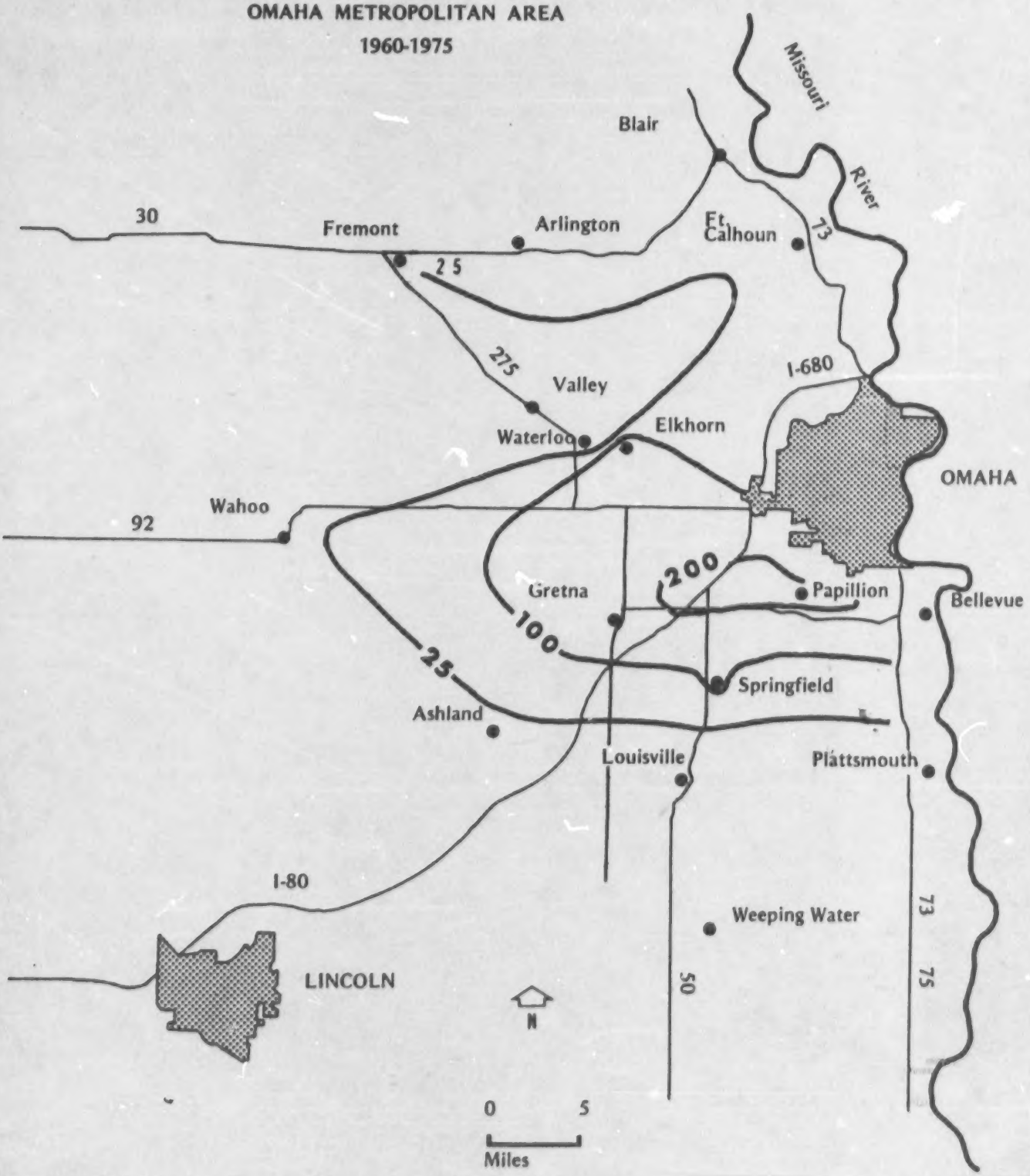
Growth-Points in the Omaha Metropolitan Area

Growth rates of 15 incorporated communities within a 40-mile radius of the Omaha metropolitan area reveal a hierarchy of growth-points as shown on Map 5. Communities with similar growth rates were connected by a contour line. The various contour lines depict the "spread effect" of Omaha as an urban center. Generally the closer the communities to Omaha, the faster their growth. The fact that all the contour lines are convex to Southwest of Omaha indicates the importance of Interstate 80 as a link between Omaha and Lincoln, the second largest urban center in Nebraska. The importance of highways is further revealed by examining communities that experienced the highest growth rates. For example, Papillion, exhibiting a 231 percent increase in population since 1960, is near Omaha and also at the intersection of four major highways: Interstate 80, State Highway 370, State Highway 50 and 84th Street of Omaha. Gretna and its surrounding area, the second highest growth-point on the hierarchy, is at the intersection of three major highways: Interstate 80, State Highway 370 and State Highway 6.

Urban Sprawl and Land Use Planning

Population growth and land development begin almost simultaneously. Land development, no matter what form it takes--housing, commercial, industrial or recreational--parallels population increase. This land conversion process spilling out into the suburbs of major urban centers has been termed urban sprawl.

MAP 5
PERCENT OF POPULATION GROWTH
OMAHA METROPOLITAN AREA
1960-1975



Urban sprawl has become one of the biggest issues in the field of urban analysis in the past two decades, but it remains poorly defined in the minds of many. One person may find tract housing distasteful because it uses too much land per housing unit and it is not fully serviced. Others may criticize strip commercial development because it lacks aesthetic beauty or is associated with air and water pollution. Clearly, urban sprawl in this sense is in the eyes of the beholder.

Land use planning, in the strict spatial sense, is the act of determining the location of different classes of land use for the maximum welfare of the community as a whole. Hence, the location of residential tracts, schools, commercial development, or parks in relation to job opportunities, property taxes, provision of public services, quality of life and living environment is the essence of land use planning. Urban sprawl can also be defined as land development without land use planning.

Land Use Planning in Gretna

Land use planning is an overall task which falls generally to governmental units and their planning agencies. Rarely does a single developer engage in land use planning except for his own development tract.

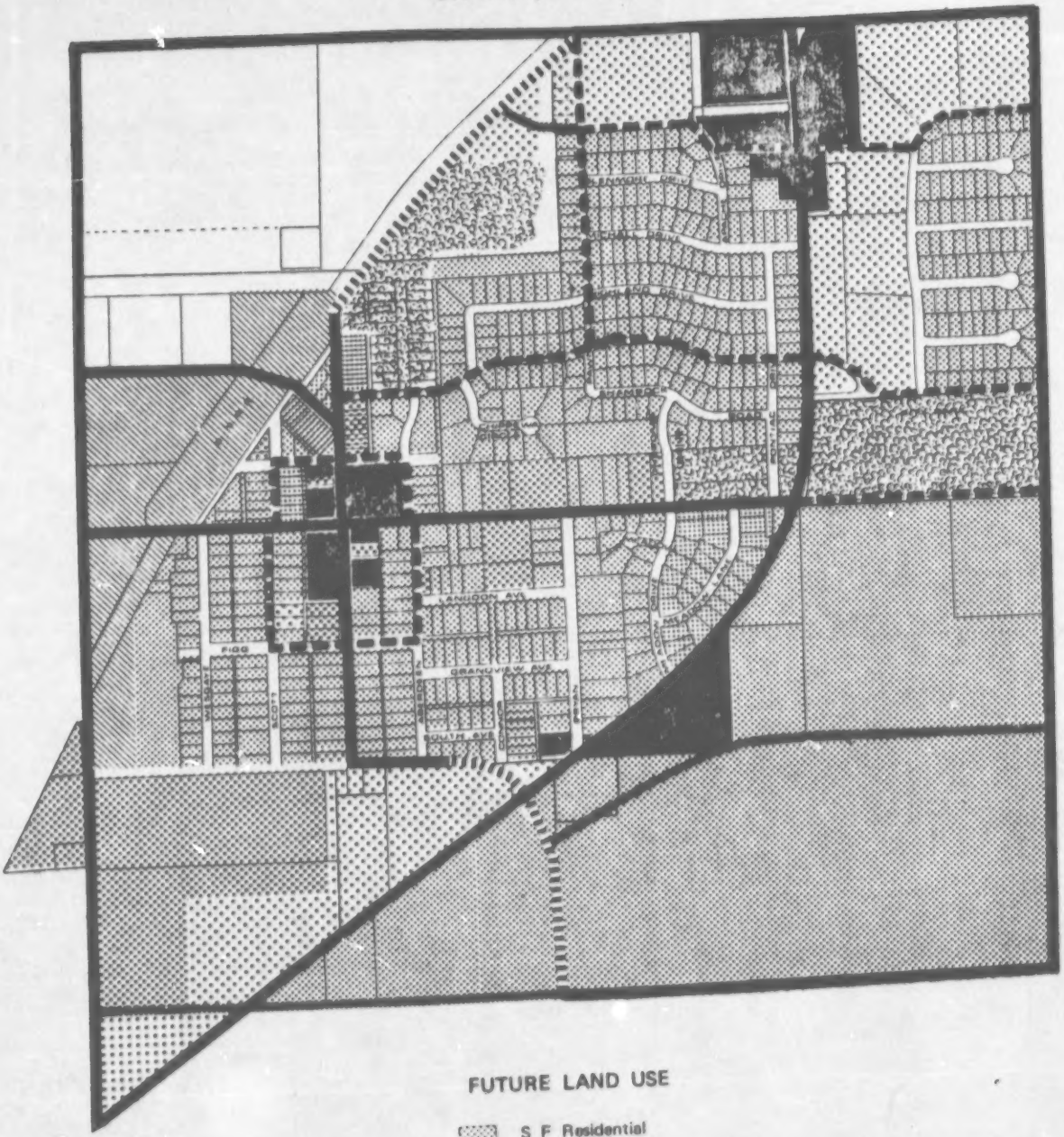
The Gretna City Council established a Planning Commission in March, 1963 to supervise land use planning activities and administer the City's zoning ordinance. In cooperation with Leo A. Daly Company of Omaha and with the support of a Federal grant from the U.S. Department of Housing and Urban Development, the Gretna Planning Commission completed a Comprehensive Plan in December, 1972. The Comprehensive Plan consisted of a Future Land Use Plan, Major Street Plan and Community Facilities Plan and included a zoning ordinance and subdivision regulations. It indicated the extent of future development desired in Gretna over the next 20 years. It is a valuable guide in determining how land should be used and where new growth should be encouraged or restricted (see Map 6).

The Gretna Planning Commission, however, has authority only over the area within Gretna's one-mile extra-territorial jurisdiction. The vast rural area outside Gretna's extra-territorial jurisdiction but within the Gretna School District is within the jurisdiction of both the Sarpy County Planning Commission and the Omaha-Council Bluffs Metropolitan Area

MAP 6

FUTURE LAND USE

GRETNA, NEBRASKA



FUTURE LAND USE

- S F Residential
- M F Residential
- Trade & Services
- Industrial
- Community Facilities
- Park & Recreation

N

0 400' 800'

Feet

PROPOSED EXISTING

- Major Street
- Collector Street

Sources: City Cierk's Office, Gretna, Nebraska;
The Comprehensive Plan, Gretna , Nebraska, Leo A. Daly, December 1972.

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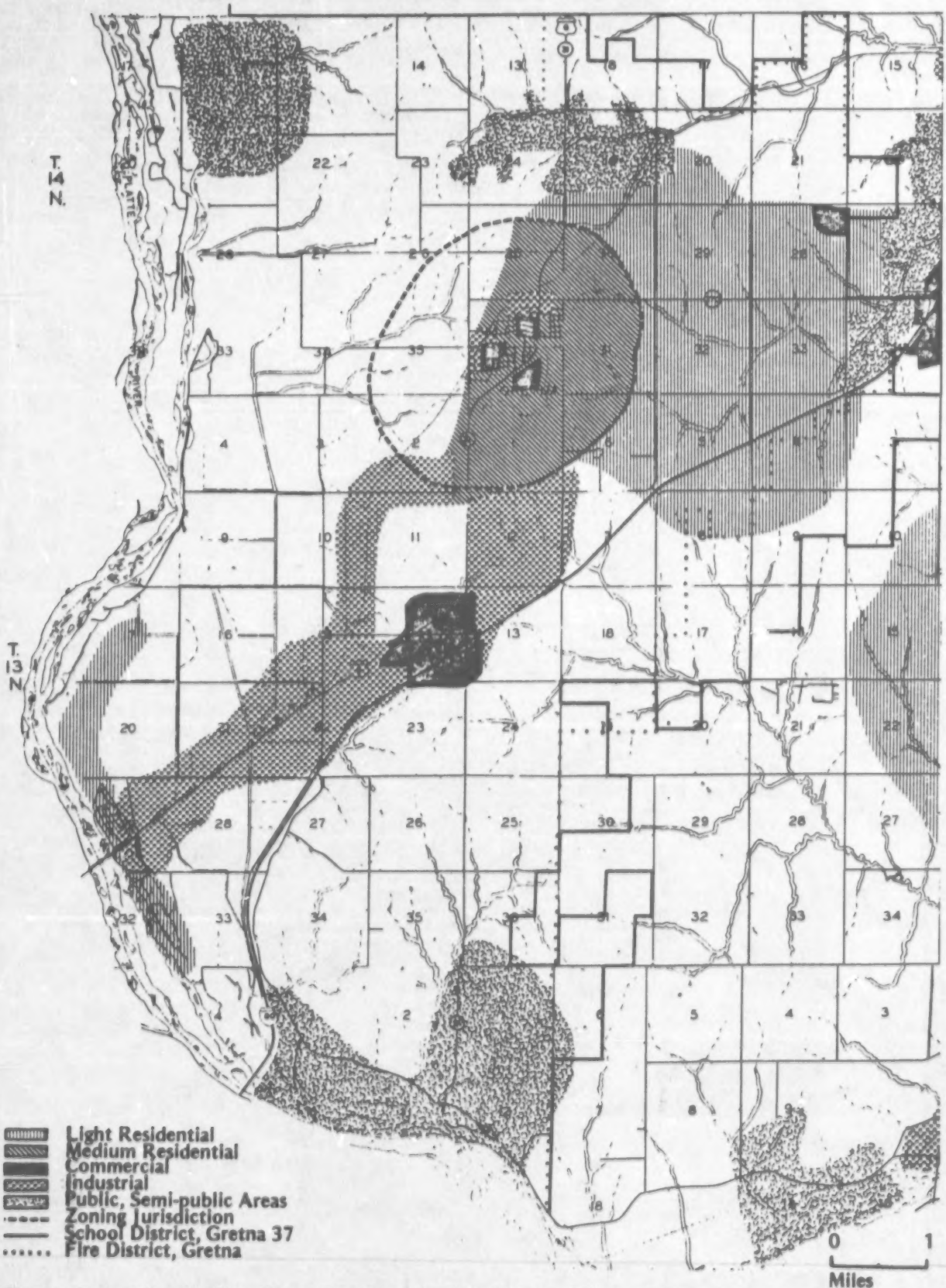
Planning Agency (MAPA) of which the Mayor of Gretna is a member of its Council of Elected Officials.

The Sarpy County's present zoning ordinance and subdivision regulations were adopted in 1959, and it was not until January 1, 1976, that Sarpy County completed a comprehensive plan with a plan of future land use pertaining to rural portion of Gretna School District (see Map 7). Furthermore, there has been no working relationship between Sarpy County and Gretna Planning Commissions and Board members of the Gretna School District on issues of land use development outside the Gretna City limits but within the Gretna School District. It seems, moreover, that MAPA has had very little effect on the programs of the local planning groups. As a result of the lack of active liaison among various levels of planning agencies, land use development in rural Gretna has been largely in the control of private developers.

MAP 7

FUTURE LAND USE, WEST SARPY COUNTY, NEBRASKA



Source: Comprehensive Plan, Sarpy County, Nebraska, 1975

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APPENDIX B

A DYNAMIC MODEL OF LOCAL GOVERNMENTAL FINANCE

Faced with rapid population in-migration, local governments have to deal with problems associated with new land development. Of particular importance is the increased demand for additional public services such as development of new recreational facilities, road and street maintenance and police and fire protection. The increased demand for additional public services has to be met with additional governmental revenue. Thus an annual governmental budget has to be structured before each fiscal year starts. The structure of such a budget is dynamic because it involves linkage of succeeding annual budgets. Familiarity with such a model is essential in the analysis of public costs associated with different patterns of new land use development.

Generally, there are three factors that have to be taken into consideration in constructing a local governmental budget: (a) the last year's budget, (b) the increase over the last year's budget due to inflation and (c) the additional costs of meeting the increased demand for public services. Such a model can be constructed in mathematical form as follows:

$$TC_t = f(aSCt) \qquad (1)$$

$$TC_{t+1} = f(TC_t, TC_t I_{t+1}, SC'_{t+1}) \qquad (2)$$

Where:

TC_t = Initial year's budget of total expenditures.

TC_{t+1} = Next year's budget of total expenditures.

a = A constant factor.

SC_t = Initial year's cost of services.

SC_{t+1} = Anticipated cost of services for the next year.

I_{t+1} = Inflation factor for the next year.

$SC'_{t+1} = SC_{t+1} - SC_t$ = The additional costs due to increased demand for public services.

Equation (1) indicates that the initial year's total expenditure, TC_t, is a function of actual costs (operating and maintenance). Equation (2) indicates that the succeeding year's budget of total expenditures TC_{t+1} is a function of three factors: the preceding year's budget, TC_t, the portion of the preceding year's budget due to price inflation, TC_tI_{t+1}, and the additional costs due to increased demand for public services, SC'_{t+1}.

If we subtract equation (1) from equation (2), a third equation is obtained as:

$$TC_{t+1} - TC_t = f(TC_t, TC_tI_{t+1}, SC'_{t+1}) - TC_t = f(TC_tI_{t+1}, SC'_{t+1})$$

or

$$SC'_{t+1} = TC_{t+1} - TC_t - TC_tI_{t+1}$$

$$= TC_{t+1} - TC_t(1+I_{t+1}) \quad \ldots \quad (3)$$

Equation (3) indicates that the additional service costs due to the increased demand for public service, SC'_{t+1} in the succeeding year can be obtained by subtracting an inflated total expenditure of the preceding year from the total anticipated budget of the succeeding year.